H-IM-711C5
Part #25006501
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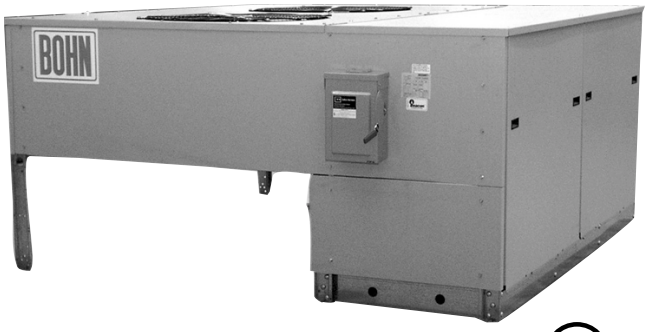
INSTALLATION & OPERATING INSTRUCTIONS

MCCU Condensing Units

BOHN
The Cold Standard

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Beacon® II
REFRIGERATION SYSTEM

HEATCRAFT Refrigeration Products
2175 W. Park Place Blvd. • Stone Mountain, Georgia 30087
(770) 465-5600 • Fax: (770) 465-5990
www.heatcraftrpd.com • e-mail: hrpd.feedback@heatcraft.com

General Safety Information

General Safety Information

1. Installation and maintenance to be performed only by certified personnel who are familiar with this type of equipment.
2. Make sure that all field wiring conforms to the requirements of the equipment and all applicable national and local codes.
3. Avoid contact with sharp edges and coil surfaces. They are a potential injury hazard.
4. Make sure all power sources are disconnected before any service work is done on units.

Inspection

Responsibility should be assigned to a dependable individual at the job site to receive material. Each shipment should be carefully checked against the bill of lading. The shipping receipt should not be signed until all items listed on the bill of lading have been accounted for. Check carefully for concealed damage. Any shortage or damages should be reported to the delivering carrier. Damaged material becomes the delivering carrier's responsibility and should not be returned to the manufacturer unless prior approval is given to do so. When uncrating, care should be taken to prevent damage. Heavy equipment should be left on its shipping base until it has been moved to the final location.

Condensing Unit Specifications

Figure 1.

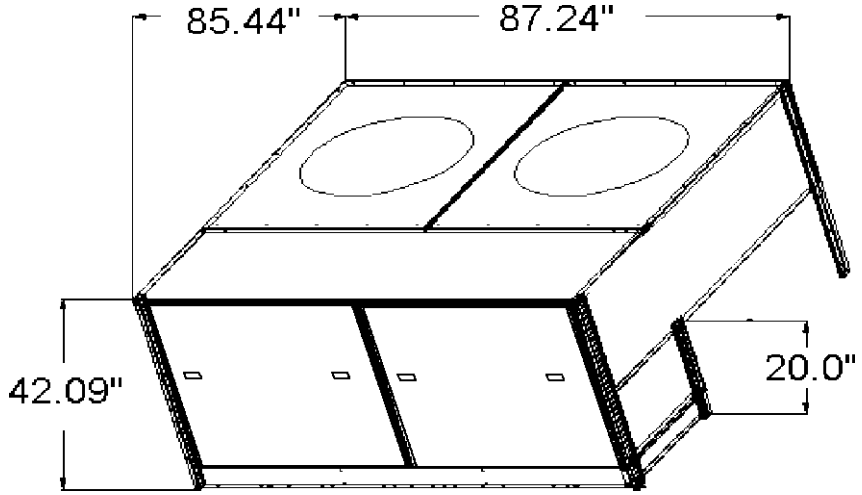


Table 1. Condensing Unit Specification Data

Condensing Unit Model	Compressor	Location	Voltage	HP	Ref.	Unit MCA	Unit MOP
MCCU56049B2N	CRN5-500	Cooler	208/230/3/60	5	22	45	60
	KALA-016E	Freezer	208/230/3/60	1.5	404A		
	RS55C1E	Ice Storage	208/230/1/60	1.0	404A		
MCCUCSTORE3B2N	CR37KQ	Cooler	208-230/3/60	3.0	22	35	40
	KALA-016E	Freezer	208-230/3/60	1.5	404A		
	KALB-010E	Ice Merch.	208-230/1/60	1.0	404A		
MCCUCSTORE4B2N	CR53KQ	Cooler	208-230/3/60	4.0	22	43	50
	KALA-016E	Freezer	208-230/3/60	1.5	404A		
	KALB-010E	Ice Merch.	208-230/1/60	1.0	404A		
MCCUCSTORE5B2N	CRN5-0500	Cooler	208-230/3/60	5.0	22	46	60
	KALA-016E	Freezer	208-230/3/60	1.5	404A		
	KALB-010E	Ice Merch.	208-230/1/60	1.0	404A		

MCA = Minimum Circuit Ampacity
MOP = Maximum Overcurrent Protection

Evaporator Specifications

Table 2. Evaporator Specification Data

Evaporator Model	Location	Fig	Capacity BTUH	Dimensions (in.)				Connections		Amps		WEIGHT (lbs.)
				A	B	W	D	Suct OD	Liq. OD	Mtrs.	Htrs.	
ADT208BHB2N2K	Cooler	2	20,800	77.50	65.25	---	---	1 1/8	1/2	2.0	--	82
ADT208BHB2N2K	Cooler	2	20,800	77.50	65.25	---	---	1 1/8	1/2	2.0	--	82
TL53SB2N	Freezer	3	5,300	46.50	---	49.13	16.50	7/8	1/2	1.5	8.50	53
LET047BHB2N6K	Ice Storage	2	4,700	29.50	17.25	---	---	5/8	1/2	0.5	3.9	29
ADT130BHB2N2K	Cooler	2	13,000	45.50	33.25	---	---	7/8	1/2	1.0	--	53
ADT130BHB2N2K	Cooler	2	13,000	45.50	33.25	---	---	7/8	1/2	1.0	--	53
ADT156BHB2N2K	Cooler	2	15,600	61.50	49.25	---	---	7/8	1/2	1.5	--	67
ADT156BHB2N2K	Cooler	2	15,600	61.50	49.25	---	---	7/8	1/2	1.5	--	67
ADT208BHB2N2K	Cooler	2	20,800	77.50	65.25	---	---	1 1/8	1/2	2.0	--	82
ADT208BHB2N2K	Cooler	2	20,800	77.50	65.25	---	---	1 1/8	1/2	2.0	--	82

Figure 2.

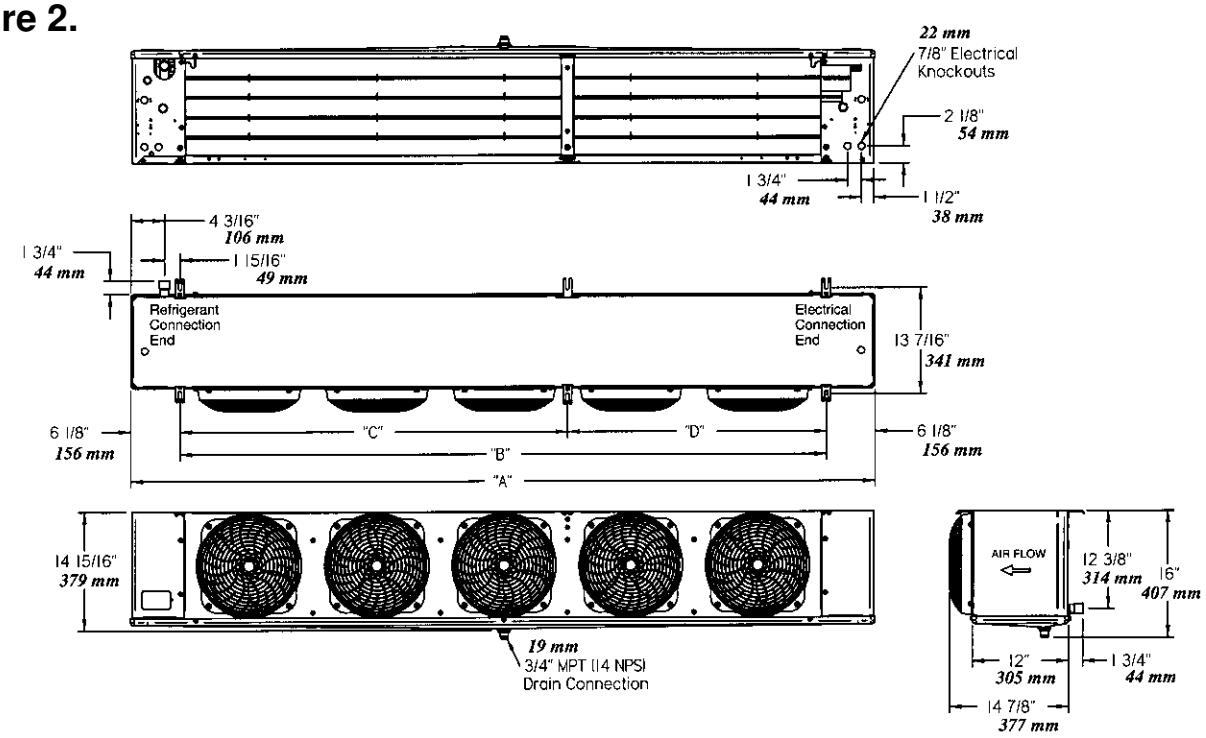
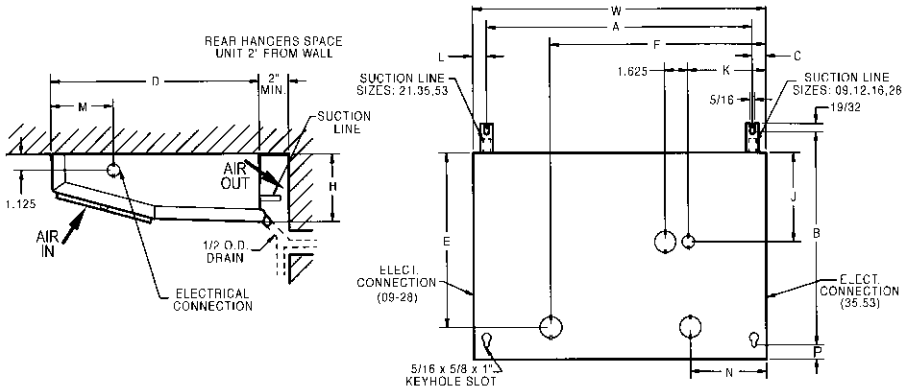


Figure 3.



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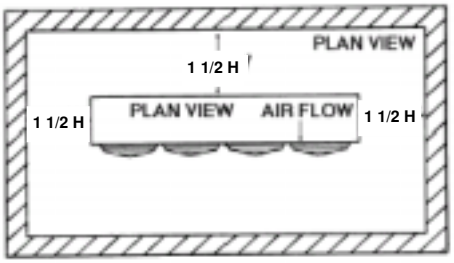
Evaporator Placement

Typical Layouts for Illustration

(refer to build plans for actual room layout and equipment location)

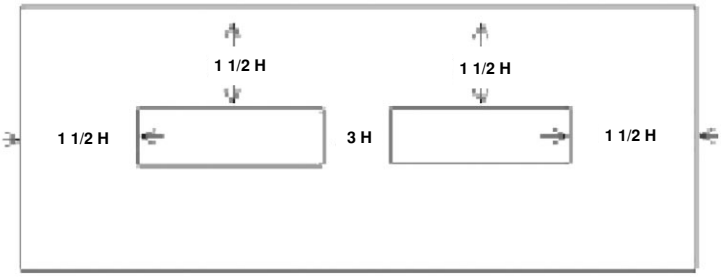
The ADT/LET units are draw through units. For best operation, they should be located away from entry doors and at least 18” from the wall with the fans blowing into the room. Make sure the units are flush mounted to the ceiling to insure proper drainage for defrost water.

Figure 3. Evaporator Placement In Cooler/Freezer



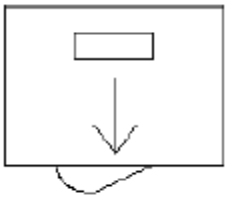
One evaporator

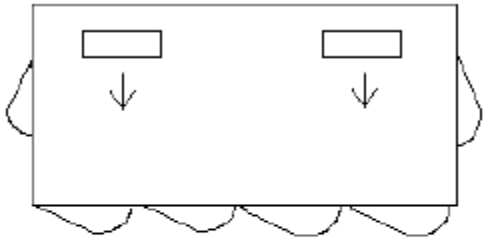
H = Total height of unit coil surface.



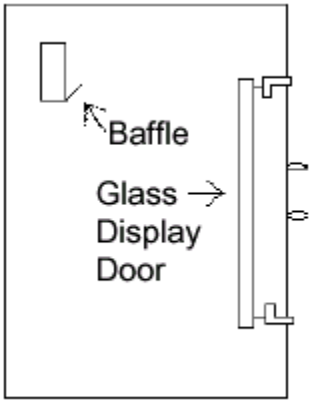
Two evaporators

NOTE: Always avoid placement of Unit Coolers directly above doors and door openings where low temperature is being maintained and wherever possible for medium temperature.





Cooler or Freezer with Glass Display Doors



Elevation view of glass display door cooler or freezer. Be sure air discharge blows above, not directly at doors. Provide baffle if door extends above blower level.

NOTE: Whenever possible, always try to position the evaporator to blow towards the vault door. Never position it over or adjacent to a door opening.

Condensing Unit Placement

Space and Location Requirements

The most important consideration which must be taken into account when deciding upon the location of air-cooled equipment is the provision for a supply of ambient air to the condenser, and removal of heated air from the condensing unit or remote condenser area. Where this essential requirement is not adhered to, it will result in higher head pressures, which cause poor operation and potential failure of equipment. Units must not be located in the vicinity of steam, hot air or fume exhausts. Corrosive atmospheres require custom designed condensers.

Another consideration which must be taken is that the unit should be mounted away from noise sensitive spaces and must have adequate support to avoid vibration and noise transmission into the building. Units should be mounted over corridors, utility areas, rest rooms and other auxiliary areas where high levels of sound are not an important factor. Sound and structural consultants should be retained for recommendations. (Refer to actual building plans for unit locations.)

Figure 4. Condensing Unit Placement

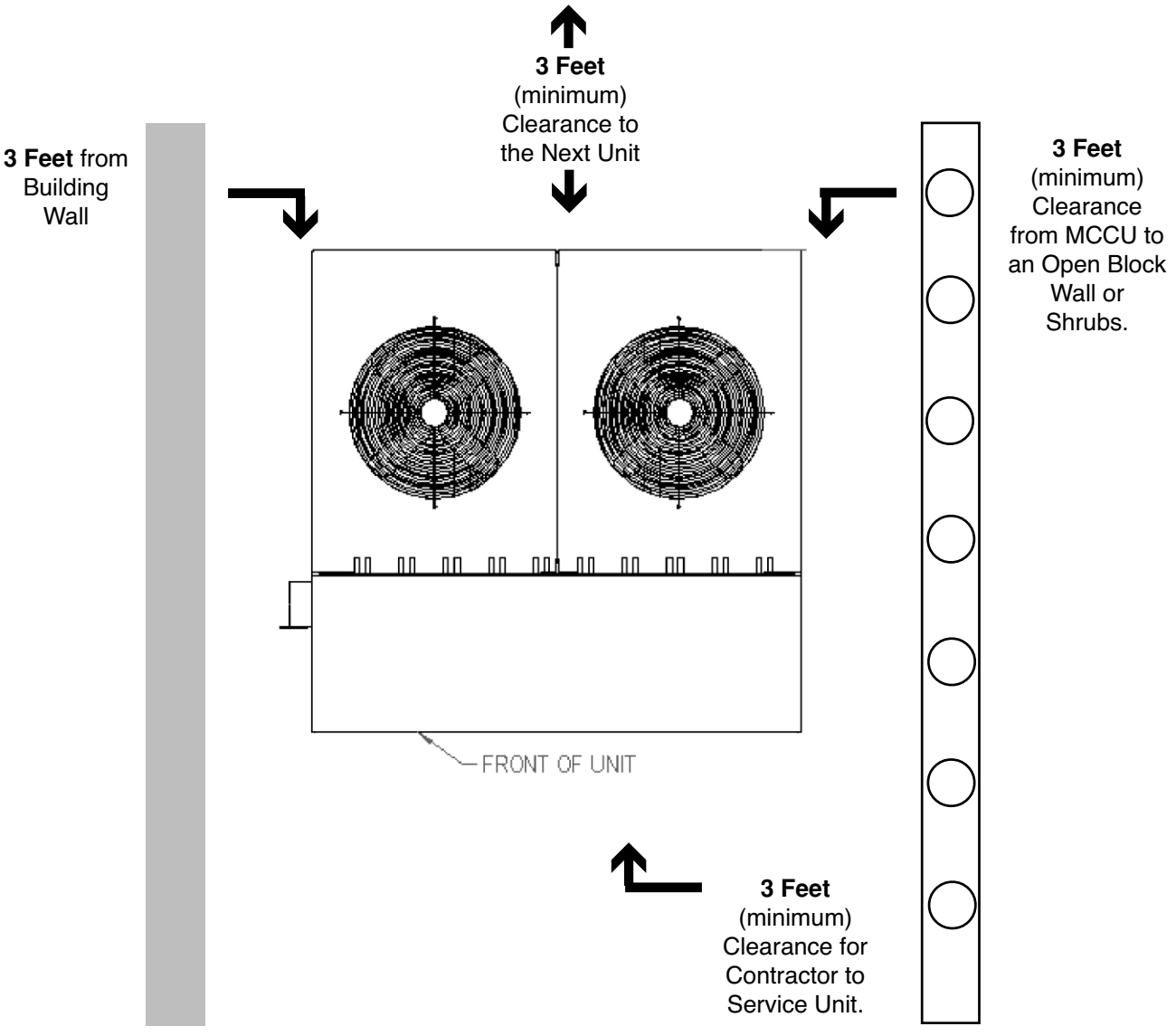
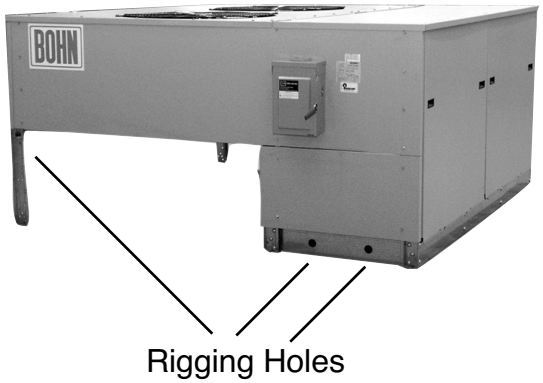


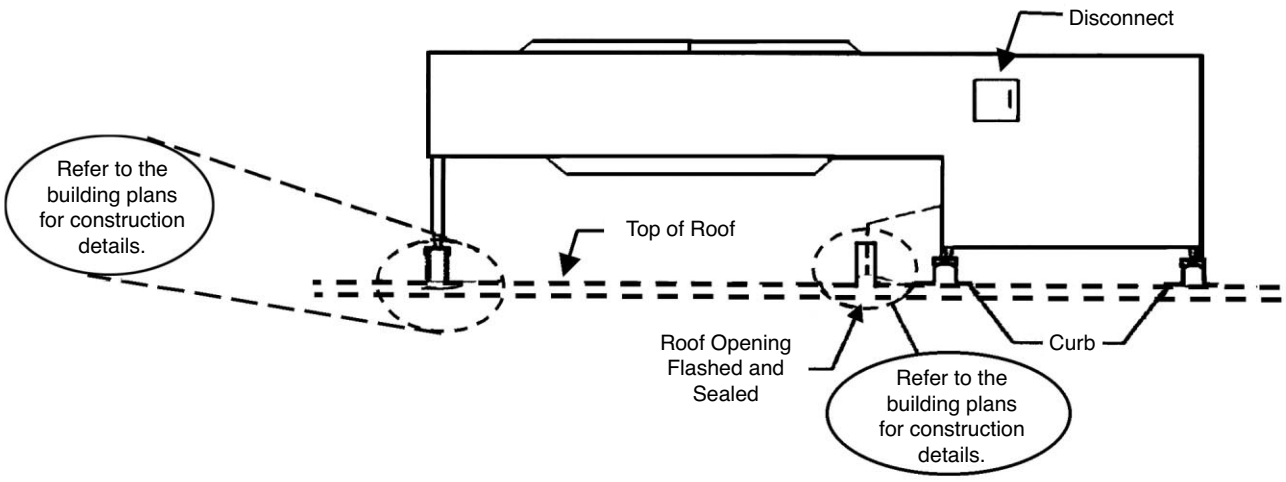
Figure 5. Condensing Unit Rigging

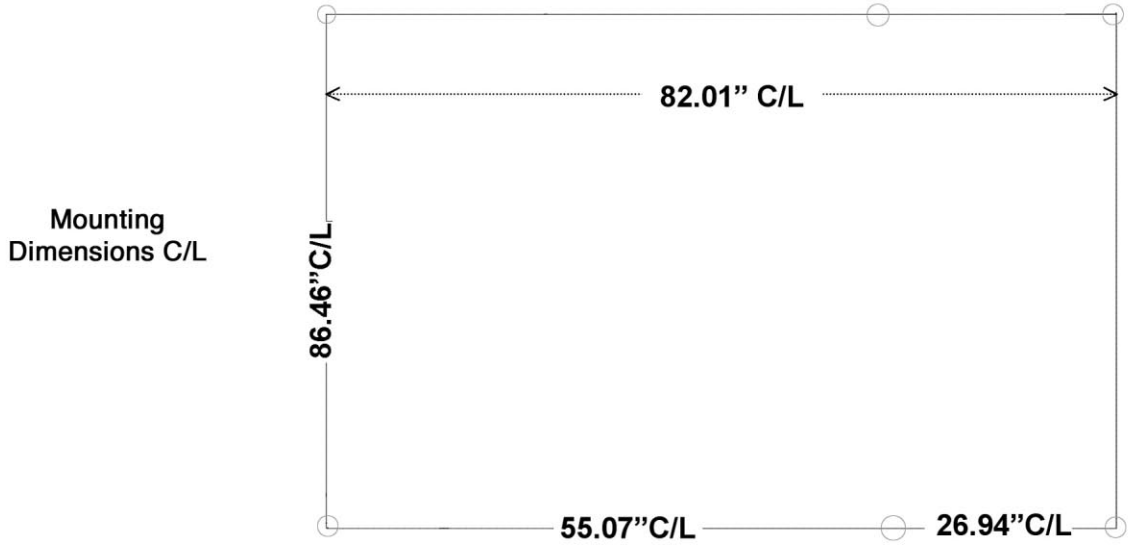
Adequate rigging measures must be taken to support unit weight and to protect the unit from damage during unloading and placement process.

Rigging holes have been provided in legs and under the unit compressor compartment frame to assist.

Spreader bars may be used to protect unit from damage.







Refrigeration Piping And Line Sizing

The system as supplied by Heatcraft, was thoroughly cleaned and dehydrated at the factory. Foreign matter may enter the system by way of the evaporator to condensing unit piping. Therefore, care must be used during installation of the piping to prevent entrance of foreign matter. Install all refrigeration system components in accordance with applicable local and national codes and in conformance with good practice required for the proper operation of the system. The refrigerant pipe size should be selected from the tables in Refrigeration System Installation Manual, Part Number 25001201. The interconnecting pipe size is not necessarily the same size as the stub-out on the condensing unit or the evaporator.

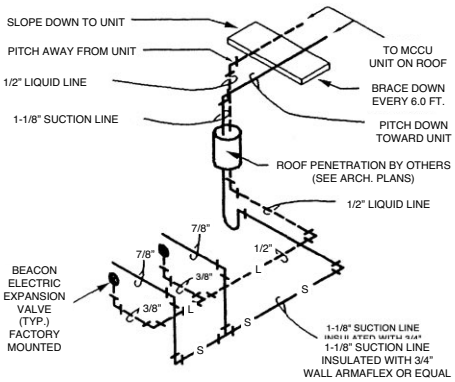
The following procedures should be followed:

(a) Do not leave dehydrated compressors or filter-driers on condensing units open to the atmosphere any longer than is absolutely necessary.
(b) Use only refrigeration grade (ACR) copper tubing, properly sealed against contamination.
(c) Suction lines should slope 1/4" per 10 feet towards the compressor (in direction of flow).
(d) Suitable P-type oil traps should be located at the base of each suction riser to enhance oil return to the compressor.
(e) For desired method of superheat measurement, a pressure tap should be installed in each evaporator suction line in the proximity of the expansion valve bulb.
(f) When brazing refrigerant lines, an inert gas should be passed through the line at low pressure to prevent scaling and oxidation inside the tubing. Dry nitrogen is preferred.
(g) Use only a suitable silver solder alloy on suction and liquid lines.
(h) Limit the soldering paste of flux to the minimum required to prevent contamination of the solder joint internally. Flux only the male portion of the connection, never the female. After brazing, remove excess flux.
(i) Remove temperature sensor attached to suction line on Beacon II systems before brazing of the solder joint internally. Flux only the male portion of the connection – never the female. After brazing, remove excess flux.
(j) Wrap expansion valves with wet rags during brazing to the liquid line.

CAUTION: If the temperature gets too high, these components may be damaged. Heat absorbing compounds or wet rags must be used to protect the expansion valve when brazing to the refrigerant piping/line connections, and the suction line sensor must be removed per above instructions.

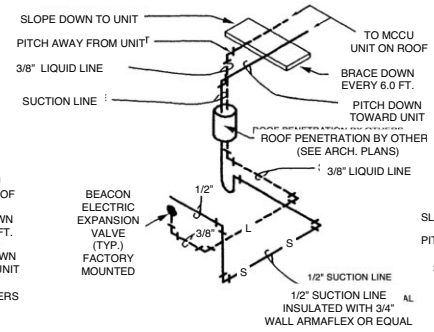
(k) Do not use "bull head" tees. This will cause oil return problems and can cause poor performance.
(l) If isolation valves are installed at the evaporator, full port ball valves should be used.

Figure 6. Refrigeration Piping Diagrams



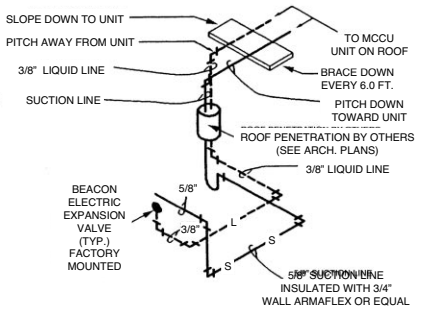
PIPING DIAGRAM FOR THE
(R22) MEDIUM TEMPERATURE COOLER
REFRIGERATION SYSTEM

10 DOOR VAULT COOLER
NOT TO SCALE



PIPING DIAGRAM FOR THE
(R404a) LOW TEMPERATURE FREEZER
REFRIGERATION SYSTEM

VAULT ICE MERCHANDISER
NOT TO SCALE



PIPING DIAGRAM FOR THE
(R404a) LOW TEMPERATURE FREEZER
REFRIGERATION SYSTEM

-10° VAULT STORAGE FREEZER
NOT TO SCALE

Suction Lines

NOTE: If the suction line must rise to the point higher than the suction connection on the evaporator, a suction line trap at the outlet of the evaporator must be provided.

Horizontal suction lines should slope away from the evaporator toward the compressor at the rate of 1/4' per 10 feet for good oil return. When multiple evaporators are connected in series using a common suction line, the branch suction lines must enter the top of the common suction line.

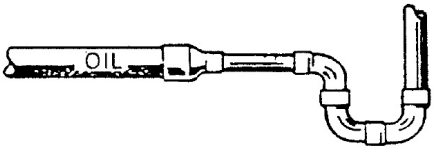
Suction lines that are outside of refrigerated space must be insulated. See "Line Insulation" for more information.

Suction Line Risers

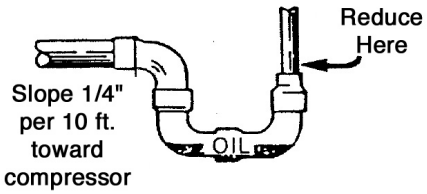
NOTE: To provide proper oil return, a suction trap must be provided at the base of all suction risers.

Prefabricated wrought copper traps are available, or a trap can be made by using two street ells and one regular ell. The suction trap must be the same size as the suction line. For long vertical risers, additional traps may be necessary. Generally, one trap is recommended for each length of pipe (approximately 20 feet) to insure proper oil movement. See Figure 7 below for methods of constructing proper suction line P-traps.

Figure 7. Suction P-traps



"INCORRECT"



"CORRECT"

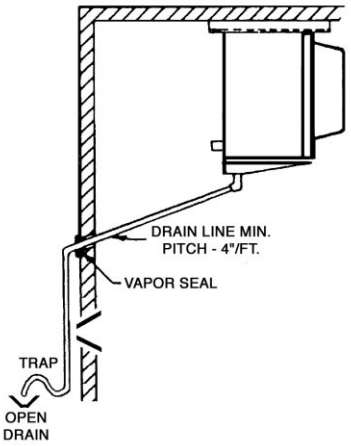
Condensate Drain Lines

Copper drain lines should be used and properly protected from freezing. In running drain lines, provide a minimum of 4 inches per foot pitch for proper drainage. Drain lines should be at least as large as the evaporator drain connection. All plumbing connections should be made in accordance with local plumbing codes. All condensate drain lines must be trapped, and run to an open drain. They must never be connected directly to the sewer systems. Traps in the drain line must be located in a warm ambient. We recommend a trap on all evaporators. Traps located outside, or extensive outside runs of drain line must be wrapped with a drain line heater. The heater should be connected so that it is continuously on. It is recommended that the drain line be insulated to prevent heat loss. A heat input of 20 watts per lineal foot of drain line for 0ºF (-18°C) room applications and 30 watts per lineal foot for -20°F (-29°C) rooms is satisfactory.

Inspect the drain pan periodically to insure free drainage of condensate. If the drain pan contains standing water, check for proper installation. The drain pan should be cleaned regularly with warm soapy water.

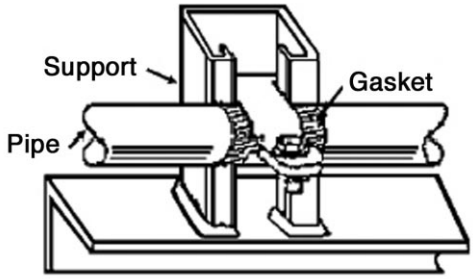
WARNING: All power must be disconnected before cleaning. The drain pan also serves as cover for hazardous moving parts. Operation of unit without drain pan constitutes a hazard.

Figure 8. Drain Line



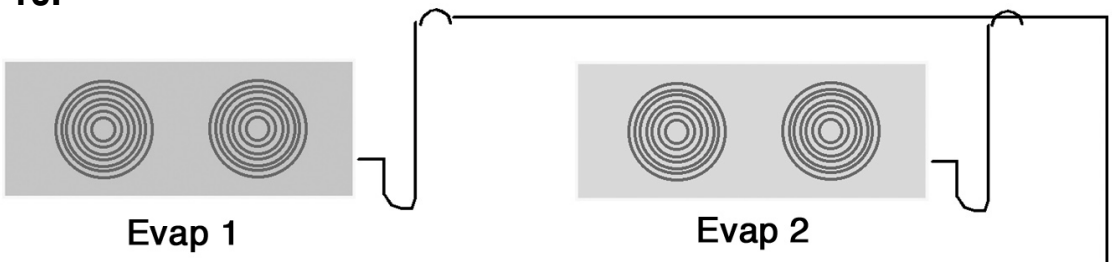
NOTE: Always trap drain lines individually to prevent vapor migration.

Figure 9. Example of Pipe Support



1. Normally, any straight run of tubing must be supported in at least two locations near each end of the run. Long runs require additional supports. The refrigerant lines should be supported and fastened properly. As a guide, 3/8 to 7/8 should be supported every 5 feet, 1-1/8 and 1-3/8 every 7 feet; and 1-5/8 and 2-1/8 every 9 to 10 feet.
2. When changing directions in a run of tubing, no corner should be left unsupported. Supports should be placed a maximum of 2 feet in each direction from the corner.
3. Piping attached to a vibrating object (such as a compressor or compressor base) must be supported in such a manner that will not restrict the movement of the vibrating object. Rigid mounting will fatigue the copper tubing.
4. Do not use short radius ells. Short radius elbows have points of excessive stress concentration and are subject to breakage at these points.
5. Thoroughly inspect all piping after the equipment is in operation and add supports wherever line vibration is significantly greater than most of the other piping. Extra supports are relatively inexpensive as compared to refrigerant loss.

Figure 10.



Line Insulation

After the final leak test, refrigerant lines exposed to high or low ambient conditions should be insulated to reduce heat loss or gain and prevent the formation of flash gas in the liquid lines. Suction lines should be insulated with 3/4' wall Armstrong "Armaflex" or equivalent. Liquid lines should also be insulated with 1/2-inch wall insulation or better. The insulation located in outdoor environments should be protected from UV exposure to prevent deterioration of insulating value.

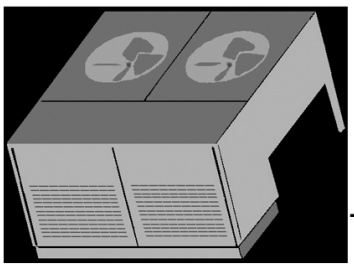
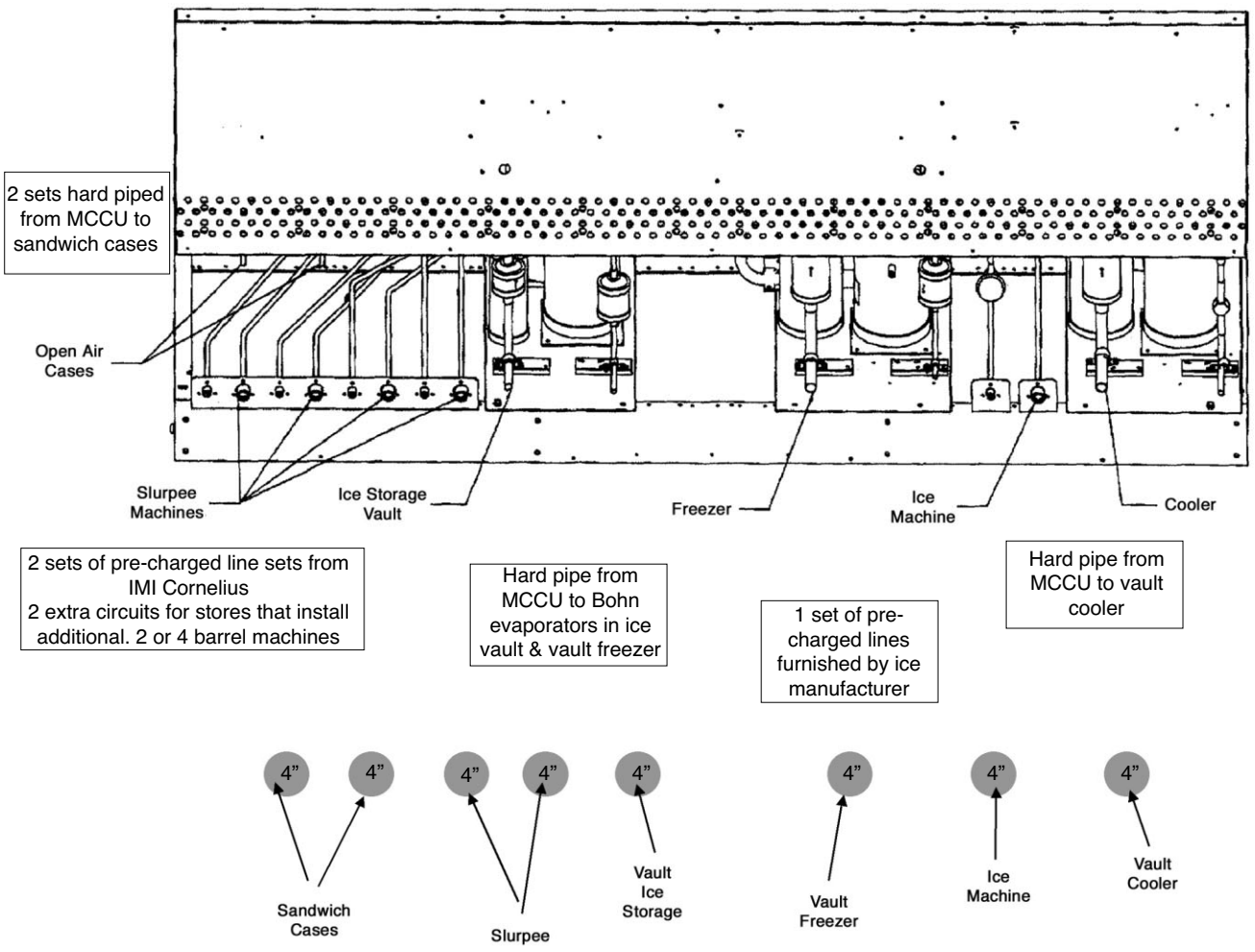


Figure 11. Piping Connection Layout (MCCU)******



Roof Penetrations

All piping and control wiring penetrations are done underneath the fan section of the condensing unit.
Refer to building plans for job details of roof penetration scheme.
The 4" PVC pipe penetrations shown above is a guide for all parties involved.

Head Pressure Controls

Heatcraft does NOT supply headmaster control for the individual display case circuits.
Refer to case manufacturers' installation instructions for specific provisions needed for head pressure control.

Note: Heatcraft does include headmaster controls on the ice machine circuit. If the ice machine equipment from the vendor includes a headmaster already, it will be necessary to clip the pigtail on the headmaster valve supplied by Heatcraft to disable it from operating and conflicting with the ice machine headmaster.

Leak Detection And Evacuation

Leak Testing

After all lines are connected, the entire system must be leak tested. The complete system should be pressurized to not more than 150 PSIG with refrigerant and dry nitrogen. The use of an electronic type of leak detector is highly recommended because of its greater sensitivity to small leaks. As a further check, it is recommended that this pressure be held for a minimum of 12 hours and then rechecked. For a satisfactory installation, the system must be leak tight.

Leak detection can be carried out in the conventional manner. If HCFC or CFC tracer gas is used, care must be taken to completely remove all traces of the gas prior to introducing HFC's. Electronic leak detectors are now available that will sense HFC's. This is considered preferable since it removes the possibility of chlorine remaining in the system after leak testing with HCFC's and/or HCFC's. There is a view that even small quantities of chlorine may act as a catalyst encouraging copper plating and/or corrosion and should therefore be avoided.

Within the last several years, manufacturers have developed fluorescent dye leak detection systems for use with refrigerants. These dyes mix with the lubricant and, when exposed to an ultraviolet light "fluoresce," indicate the location of leaks. Copeland has tested and approved the Rigid "System Safe" dye and found it to be compatible with the compressor materials in systems.

Evacuation

CAUTION: Do not use the refrigeration compressor to evacuate the system. Do not start the compressor while it is in a vacuum.

Due to the smaller molecule size of HFC's, they will tend to leak more readily than CFC. Consequently, it is of the utmost importance that proper system evacuation and leak detection procedures be employed. Copeland recommends a minimum evacuation to 500 microns. In addition, a vacuum decay test is strongly recommended to assure there is not a large pressure differential between the system and vacuum pump. Good evacuation processes include frequent vacuum pump oil changes and large diameter, short hose connections to both high and low sides of the system preferably using bronze braided hose.

A good, deep vacuum pump should be connected to both the low and high side evacuation valves with copper tube or high vacuum hoses (1/4" ID minimum). If the compressor has service valves, they should remain closed. A deep vacuum gauge capable of registering pressure in microns should be attached to the system for pressure readings.

A shut-off valve between the gauge connection and vacuum pump should be provided to allow the system pressure to be checked after evacuation. Do not turn off vacuum pump when connected to an evacuated system before closing shut-off valve.

The vacuum pump should be operated until a pressure a 1,500 microns absolute pressure is reached – at which time the vacuum should be broken with the refrigerant to be used in the system through a drier until the system pressure rises above "0" psig.

NOTE: Refrigerant used during evacuation can not be vented. Reclaim all used refrigerant. EPA regulations are constantly being updated. Ensure your procedures follow correct regulations.

Repeat this operation a second time.

Open the compressor's service valves and evacuate the entire system to 500 microns absolute pressure.

Raise the pressure to 2 psig with the refrigerant and remove the vacuum pump.

Field Wiring

WARNING: All wiring must be done in accordance with applicable codes and local ordinances.

The field wiring should enter the areas as provided on the unit. The wiring diagram for each unit is located on the inside of the electrical panel door. All field wiring should be done in a professional manner and in accordance with all governing codes. Before operating unit, double check all wiring connections, including the factory terminals. Factory connections can vibrate loose during shipment.

1. The nameplate on the unit is marked with the electrical characteristic for wiring the unit.
2. Consult the wiring diagram in the unit cooler and in the condensing unit for proper connections.
3. Wire type should be of copper conductor only and of the proper size to handle the connected load.
4. The unit must be grounded.
5. For multiple evaporator systems, follow the wiring diagrams for multiple evaporator systems carefully. This will assure complete defrost of all evaporators in the system.
6. If a remote defrost Timer is to be used, the Timer should be located outside the refrigerated space.

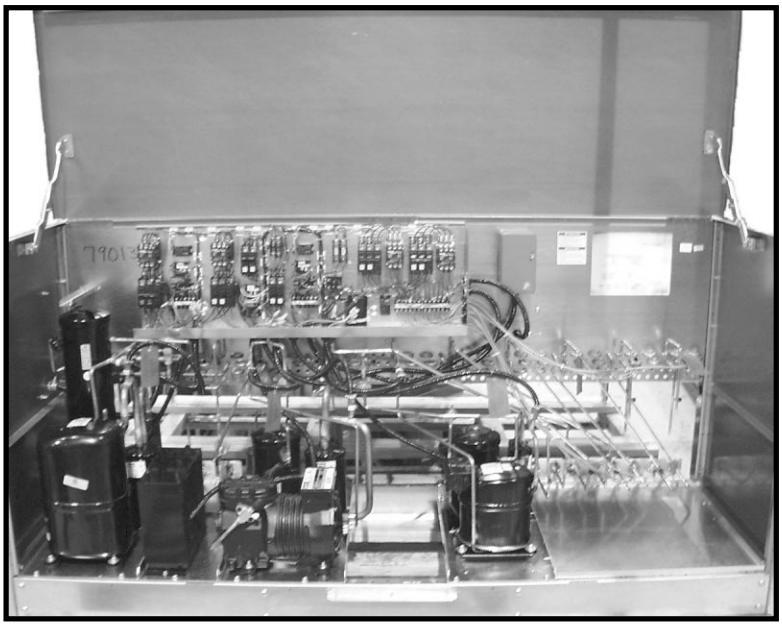
Note: Control wiring from the Ice Machines must be connected to the relays in the MCCU Control Panel to properly energize condenser fans.

Table 3. Fan Cycling Relay

Relay #	Remote Unit	Voltage
R4	Ice Machine	208-240**

** Hoshizaki ice machines require a 115 volt relay which must be field supplied replacing the factory relay.

Figure 12.



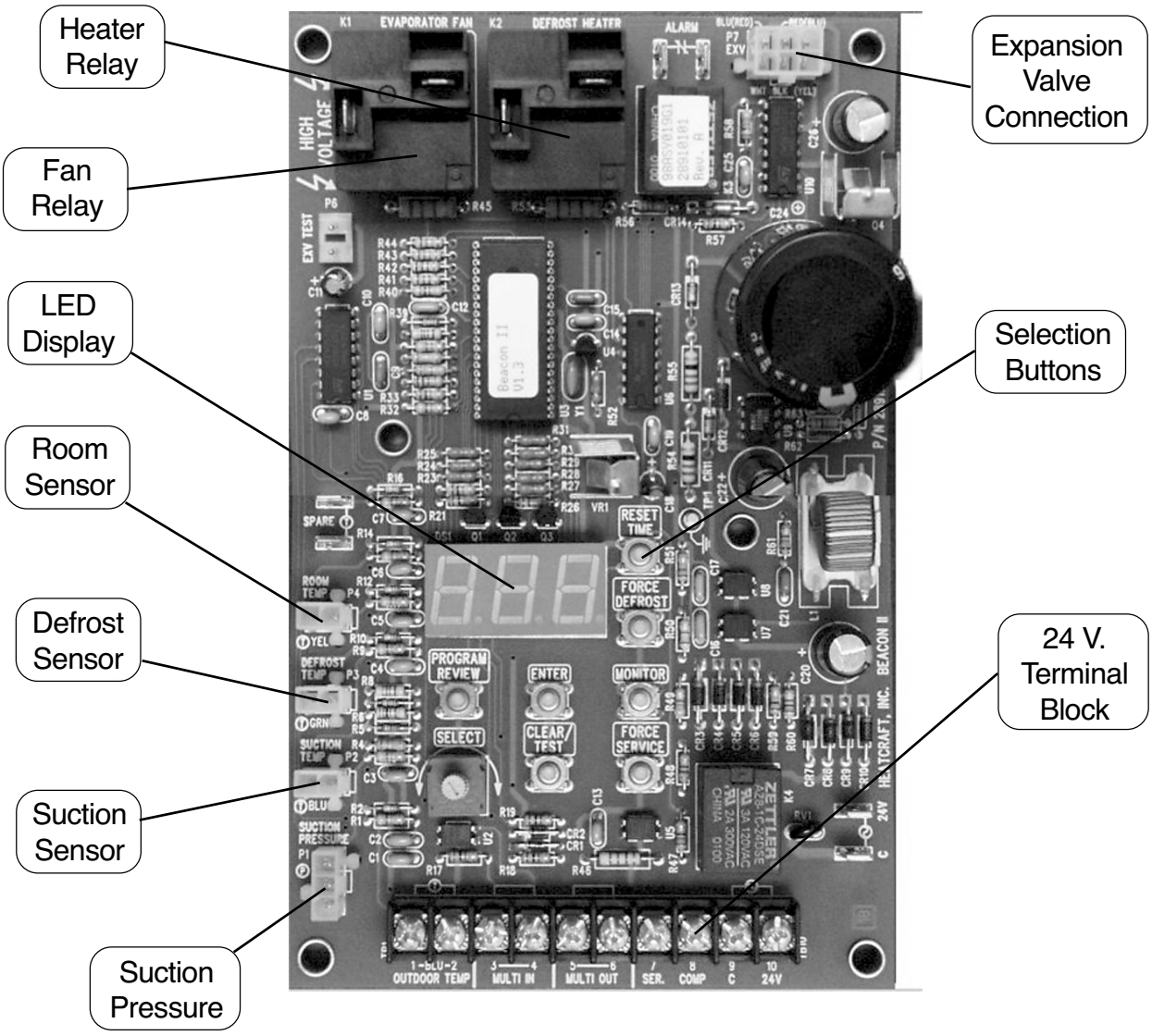
Field Wiring

WARNING: All wiring must be done in accordance with applicable codes and local ordinances.

The field wiring should enter the areas as provided on the unit. The wiring diagram for each unit is located on the inside of the electrical panel door. All field wiring should be done in a professional manner and in accordance with all governing codes. Before operating the unit, double check all wiring connections, including the factory terminals. Factory connections can vibrate loose during shipment.

1. The nameplate on the unit is marked with the electrical characteristic for wiring the unit.
2. Consult the wiring diagram in the unit cooler and in the condensing unit for proper connections.
3. Wire type should be of copper conductor only and of the proper size to handle the connected load.
4. The unit must be grounded.

Figure 13. Beacon II Board



Installation Tips

- Use a minimum 18 gauge wire for all low voltage connections.
- The Beacon II board get its 24 VAC power supply from a transformer mounted in the electrical end of each evaporator. On 208-240 volt systems the multi-tap transformer is shipped from our factory wired for 240 volts. If your supply voltage is 208 volt you must change to the 208 volt tap on the transformer.
- Refer to wiring schematic shipped on units for wiring. Schematics in this Installation and Operation Manual are typical wiring schematics only.
- Program ALL slave evaporators as SLAVES.
- Evaporators are shipped from our factory with a preset box setpoint temperature of 35°F for air defrost and -10°F for electric defrost. If your box setpoint temperature requirements are different this must be set using directions outlined under “Room Temperature Control”.
- The suction line temperature sensor **MUST** be removed from the suction line before brazing the suction tubing. The sensor **MUST** then be reinstalled on the suction line after brazing is completed and the tubing has cooled. Insulate when finished.
- The low pressure switch time delay relay, located in the condensing unit, must be set to one minute.
- Some systems may require the crankcase heater to be energized 24 hours prior to start-up. The Beacon II should be de-energized for this period by placing it in the SERVICE MODE. This is done by pressing the “FORCE SERVICE” button twice. To start the system cooling, press the “CLEAR” button.
- Room sensors must be left connected on ALL evaporators.
- A pressure transducer is installed on the evaporator. Do not leak test system above 150 PSI or damage to transducer could occur.

Condensing Unit

The condensing unit control panel contains the relays, contactors, and a terminal block which is appropriately marked to match the low voltage wiring connections. A sensor for outdoor air temperature measurement is installed on the condensing unit.

Condensing unit must be installed using proper refrigeration practices and codes. Make sure there is good airflow and good clearances around unit.

Evaporator Unit

The evaporator contains the BEACON II controller(s), electric expansion valve(s), pressure transducer, distributor(s), orifice(s), transformer and three sensors. These components are all factory mounted and wired. The three sensors are factory mounted and provide input to the controller from the following: defrost temp., suction temp., room temp.

Each evaporator unit must be installed using proper refrigeration practices and codes. Make sure the piping is correctly sized and properly routed. It is highly recommended that the liquid and suction lines be insulated. There must also be good clearance around the unit. See Heatcraft Refrigeration Installation Manual for more details.

Refrigerant Line Brazing (*CAUTION*)

The electric expansion valve and the suction temperature sensor on the suction line are factory installed. Care must be taken when brazing these lines at the evaporator. ***Too high a temperature may destroy these components. Heat absorbing compounds or "wet rags" must be used when brazing the refrigerant line connections. The suction line sensor should be removed before brazing.***

Power Supply

The Beacon II board gets its 24 VAC power supply from a transformer mounted in the electrical end of each evaporator. On 208-240 volt systems the multi-tap transformer is shipped from our factory wired for 240 volts. If your supply voltage is 208 volt you must change to the 208 volt tap on the transformer.

VERY IMPORTANT: If the supply voltage to the evaporator is 208 volts, the primary tap of the transformer must be moved to the 208 volt tap. ***This must be done for all the evaporators on that system.***

If the 24 VAC power supply falls below 18 VAC the system may power down and shut off. When the power supply is corrected to 24 VAC the system will restart after the four minute hold-off period and resume normal operation.

On Beacon II systems the main power for the evaporator can be supplied separately from the power supply of the condensing unit. All wiring, however, must comply with local electrical codes.

Wiring

Wiring between the condensing unit and the unit cooler(s) will be as follows (see attached wiring diagrams):

- High voltage – There may be high voltage on the defrost heater relay and the fan relay. The evaporator may also be connected to a separate power supply from the condensing unit. See unit cooler spec. plate for ampacity.
- Low voltage – 24V Class II control circuit. A total of five low voltage leads are required to connect the condensing unit to the evaporator (see wiring diagram). Two of these leads are for connecting the outdoor temperature sensor. The other three leads are for connecting the compressor relay, service relay and 24V Common inputs. ***All 24 volt wiring must be run separate from the line voltage wiring.***
- Low voltage wiring must be 18 gauge minimum. For low voltage wiring, maximum distances are:

Condensing unit to MASTER evaporator	500 ft.
Smart Controller to MASTER evaporator	1,000 ft.

- Alarm circuit – The onboard alarm is a dry set of NC contacts which closes to indicate an alarm. The type and wiring for the alarm is customer specified. Note that the alarm circuit does not distinguish or indicate what has caused the alarm.
- All wiring must comply with all applicable codes and ordinances.

Box Temperature Control Settings

- There is an on board **room thermostat** on the Beacon II board which can be adjusted to the desired room temperature. The temperature differential is 2°F.

 Temperature Differential

 When a system is in the cooling mode and the box setpoint is 35°F, the system will continue to cool until the box temperature gets to 34°F. At this point the compressor will pumpdown and shut off. The system will restart cooling when the box temperature has risen to 36°F.

 It is important to note that Beacon II has a minimum 2-minute "ON" time and a minimum 4-minute "OFF" time. This means that the system will run in the cooling mode a minimum of 2 minutes even if the setpoint temperature is met. In applications where the system is grossly oversized, the box temperature could go below the differential temperature before the system cycles off.

 In the "OFF" cycle, the system will be off for a minimum of 4 minutes even if the box temperature goes above the differential temperature before cooling will be restarted.

- The on board **room thermostat** is factory set at 35°F for air defrost systems and -10°F for electric defrost systems.

Initial Power On

At the initial application of power to the system, the compressor and the evaporator fans will be in a 4-minute hold-off cycle and will not start immediately. When there is a call for COOLING, the expansion valve (EEV) opens, then the compressor is started. The compressor will then run for a minimum of 2 minutes in the "hold-on" cycle. (This means that the compressor will run for a minimum of 2 minutes before shutting off even if the box temperature is met).

The LED alternately displays *BOX TEMPERATURE* and *MORE* of operation. On a call for cooling, ***dLY*** will show while the expansion valve is opening. After the compressor starts, the LED will alternately display *BOX TEMPERATURE* and ***Coo***.

When the room thermostat setting is satisfied, and if the compressor ran for at least 2 minutes, the EEV will close and the compressor will pumpdown and shut off. The evaporator fans will continue to run. The LED will alternately display ***oFF*** and *BOX TEMPERATURE*.

When the room sensor detects a rise in temperature of approximately 2°F, and the compressor has been off for at least 4 minutes, the EEV will open to its last position then the compressor will start. The valve is then adjusted as necessary to obtain the setpoint superheat setting. During this time, the compressor will run for a minimum 2 minutes "hold-on" cycle.

The 4 minute "hold-off" can be bypassed and the system started immediately by pressing the "Reset" button on the Beacon II board.

Figure 14. Operating Mode Display

oFF – Off
Coo – Cooling
Pdn – Pumpdown
dEF – Defrost
drn – Draining
dLY – Delay
tSt – Test
SEr – Service



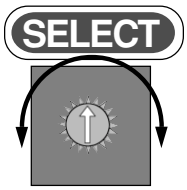
Programming And Reviewing Settings/Changes

The **Program Review** button is used to program, review and change all program settings for the system.

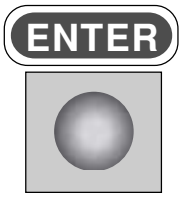
Press **"PROGRAM REVIEW"** button. The Setpoint item will appear on the LED. After a few seconds delay the Setpoint value will display. Each time the button is pressed a different setpoint item is displayed.



Next, use the **"SELECT"** knob to change value of Setpoint Item.



Next, when the desired value is selected, press the **"ENTER"** button to place it in program memory. If the **"ENTER"** button is not pressed, the value will not be stored in the memory and thus will not be changed.



"PROGRAM REVIEW" ITEMS

- ***A-E*** – Set Defrost Type (*Air* or *ELE*)
- ***rEF*** – Set Refrigerant Type (R22, R404A or R507)
- ***bot*** – Set Box Temperature (-30°F to +70°F)
- ***SUP*** – Set Superheat (4°F to 20°F)
- ***SLA*** – Set Board as a Slave (Yes or No)
- ***dFn*** – Set Number of Defrosts Per Day (1, 2, 3, 4, 5, 6, 8, 10 or 12 per day)
- ***dFF*** – Set Defrost Fail-safe Time (10 to 200 minutes)
- ***dFt*** – Set Defrost End Temperature (40°F to 100°F)
- ***dFS*** – Set Defrost Delay Start Time (0.5 Hours to 23.5 Hours)
- ***ALH*** – Set Alarm High Temperature (-40°F to 90°F)
- ***ALL*** – Set Alarm Low Temperature (-40°F to 90°F)
- ***ALt*** – Set Alarm Time (2 to 120 minutes)
- ***F-C*** – Set Fahrenheit/Celsius Temperature Units (°F / °C)

Programming And Reviewing Settings/Changes (continued)

Use the **"PROGRAM REVIEW"** button to select these items:



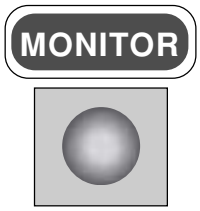
- Defrost Type – ***"A-E"*** – Selection is made for air defrost or electric defrost coil. This will automatically set the system factory defaults for air defrost and electric defrost. (See default settings). Please note that the refrigerant type *default* for air defrost is R22 and for electric defrost it is R404A. All units are shipped with factory default settings.
- Refrigerant Type – ***"rEF"*** – Selection for type of refrigerant – R22, R404A or R507.
 Default: Air defrost is R22 and for electric defrost is R404A.
- Box Temperature – ***"bot"*** – Select box temperature setpoint. Selection range is -30°F to +70-°F.
 Default: Electric defrost -10° F and air defrost +35° F.
- Superheat – ***"SUP"*** – Evaporator superheat is controlled by the board on each evaporator. Each board measures the evaporator saturation suction temperature and the suction pressure to determine the superheat. The superheat value at the evaporator can be changed to ensure a 20°F to 30°F superheat at the compressor.
 Default: 8° F.
- Evaporator Board: SLAVE – ***"SLA"*** – On multiple evaporator systems, each evaporator board has to be programmed to be a MASTER or a SLAVE. Each board is shipped from our factory set as a MASTER. You must make this change to each SLAVE evaporator. A selection of "YES" is made for this setting.
 Default: MASTER on each board. For a single evaporator system, no change is required.
- Number of Defrosts Per Day – ***"dFn"*** – A selection must be made for the number of defrosts cycles per day – 1, 2, 3, 4, 5, 6, 8, 10 or 12 per day. If no selection is made:
 Default: Electric defrost is 4 per day and air defrost is 2 per day.
- Defrost fail-safe – ***"dFF"*** – This is the maximum time allowed for a coil to remain in defrost. Defrost will be terminated if the defrost end temperature is not attained when this time has expired. On multiple evaporator systems, this is controlled by the MASTER unit. Each board should have the same setting.
 Default: Electric defrost is 30 minutes and air defrost is 40 minutes.
- Defrost End Temperature – ***"dFt"*** – This is the temperature at which the defrost will be terminated.
 Default: Electric defrost is +60° F and air defrost is +45° F.
- Defrost Delay Start Time – ***"dFS"*** – This allows the delay of the start of the defrost.
 Default: 0.5 hours to 23.5 hours.

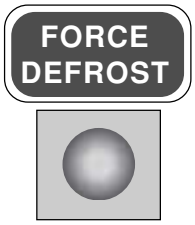
Programming And Reviewing Settings/Changes (continued)

- Alarm High Temperature – ***"ALH"*** – Temperature at which a high box temperature alarm will be triggered. This does not apply during defrost.
 Default: Electric defrost is +5°F and air defrost is +50°F.
- Alarm Low Temperature – ***"ALL"*** – Temperature at which a low box temperature alarm will be triggered.\
 Default: Electric defrost is -15°F and air defrost is +30°F.
- Alarm Time – ***"ALt"*** – Time which high temperature or low temperature conditions must exceed before alarm is triggered.
 Default: 60 minutes.
- °F/°C – ***"F-C"*** – Select units to display temperature. Fahrenheit or Celsius.
 Default: Fahrenheit.
- When °C is selected a red dot will appear in the right bottom corner of the LED display of the Beacon II board.

Use the "MONITOR" button to review these items:

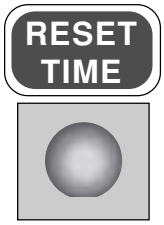
SUP – Superheat (°F)
ESP – Expansion Valve Stems (0 to 255 steps)
SCt – Suction Temperature (°F)
SSt – Saturated Suction Temperature (°F)
SCP – Suction Pressure at Evaporator (PSIG / "HG)
Odt – Outdoor Temperature (°F)
dFt – Defrost Sensor Temperature (°F)
dFE – Last Defrost Elapsed Time (minutes)
AC – Board Voltage
SPt – Spare Temperature Reading

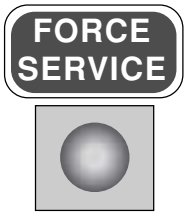




Use this button to **"FORCE DEFROST"**
To force a defrost, press the **"FORCE DEFROST"** button. The system will pumpdown and shut off the compressor. The heaters are then turned on. The display will show ***"dEF"***.

Use this button to **"RESET TIME"**
Pressing this button will reset the time clock in the microprocessor to zero. At initial power up, pressing this button will bypass the "four minute" hold-off and the system will start immediately after the expansion valve opens. This display will show ***"dLy"***.

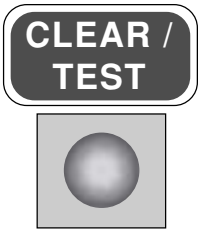




Use this button to **"FORCE SERVICE"**
Pressing this button TWICE will cause the system to pumpdown and the compressor to shut off. The system will remain off until the "CLEAR" button is pressed. While in the "FORCE SERVICE", the LED display will show ***"SEr"***.

Programming And Reviewing Settings/Changes (continued)

Use this button to **"CLEAR/TEST"**
Pressing this button ONCE will return the LED display to the default display.
With the system in the ***OFF*** mode, pressing and holding this button will start the ***"TEST"*** mode. In the ***"TEST"*** mode it will cycle through each output.



STATUS INDICATOR LED
A red, 3-digit, alphanumeric LED on the Beacon II board indicates status, alarms and error codes.



Status	LED Display	Description
• **OFF** All Evaporators	Box Temp / ***oFF***	Box Temperature / Mode is displayed
•COOLING Single Evaporator –	Box Temp / ***Coo***	Box Temperature / Mode is displayed
Multiple Evaporators Master Evap – Slave Evaps –	Box Temp / ***Coo*** ***Coo***	Box Temperature / Mode is displayed Operating Mode is displayed
• **Pumpdown** All Evaporators	***Pdn***	
• **DEFROST** All Evaporators	***dEF***	
• **TEST** All Evaporators	***tSt***	
•SERVICE All Evaporators	***SEr***	
• **ALARMS**	***A1*** ***A2*** ***A3*** ***A4***	High Box Temp Low Box Temp System Start-Up Failure Compressor does not start after 3 times. (Four minutes between each try) Input Fault Box Temp., Suction Temp., Pressure Transducer open or not installed

STATUS INDICATOR LED (continued)

Status	LED Display	Description
• **ERRORS**	***E1***	Room temperature sensor shorted, open or not installed
	E2	Defrost temperature sensor shorted, open or not installed
	E3	Suction temperature sensor shorted, open or not installed
	E4	Suction pressure transducer shorted, open or not installed
	E5	Outdoor temperature sensor shorted
	E6	Low superheat during cooling
	E7	Compressor shutdown (high or low refrigerant pressure or low oil pressure)
	E9	Multi-in/Multi-out wiring error
• **OTHERS**	***Coo***	Room Temperature sensor open or not connected (Instead of displaying box temperature)
	Loc	Board is locked. Settings cannot be changed
	UnL	Unlock the board settings

Low Ambient Operation

All units are shipped standard with head master valves. (Scroll compressor units have a 100 PSI head master valve and all other systems have a 180 PSI head master valve.) Condensing units with **multiple condenser fans** will have one or more fans cycle on Pressure Fan Cycling switch.

An adjustable Time Delay relay, factory set at 1 minute, is wired across the Low Pressure Switch (LPS). In cold ambient this allows time for the suction pressure to build up and prevent nuisance tripping of the LPS. In warmer ambient this time delay relay can be adjusted to 0 minutes.

Pumpdown

At the end of each cooling cycle, when the box temperature is met, the Beacon system will pumpdown and shut off the compressor.

To pumpdown, the EXV closes and the compressor runs until one of the following occurs:

- the low pressure switch opens
- the suction pressure at the evaporator is 4 psig
- a total of two minutes has elapsed.

When any of these three conditions occur the compressor will turn off and not restart until there is a call for cooling.

Periodic pumpdown

While in the OFF cycle, if there isn't a call for cooling (box set-point temperature is met) but:

- the evaporator suction pressure has risen to 10 psig
- the low pressure switch has closed.

The system will initiate a pumpdown. This periodic pumpdown will occur at 4 minute intervals when these two conditions are met.

Service Mode

A single pole, single throw switch (SPST) is supplied in each condensing unit for shutting off the system. Closing the “Service” switch in the condensing unit will cause the system to pumpdown and shut off. “Ser” will be displayed on the Beacon board LED and “SERVIC” is displayed on the Smart Controller LCD display. The evaporator fan and heaters will be de-eneergized in the Service Mode. **The system will not restart until the SPST switch is placed in the “NORMAL” or “OFF” position.**

or

The system can be pumped down by pressing the “SERVICE” button twice. To restart the system, press the “CLEAR” button.

or

The system can be pumped down for service by closing the liquid line service valve in the condensing unit, then closing the suction line service valve when the system trips on the low pressure switch.

Defrost

DEFROST TIMING
When power is first applied to the system, its timer starts counting time. If 4 defrosts are programmed, it will initiate a defrost every 6 hours from when power was first applied. Beacon II does not have a real time clock. Beacon II does provide the ability to delay the starting of the first defrost.

DEFROST DELAY START TIME
Example: The system is first powered up at 8:00 AM and is programmed for 4 defrosts per day. The user would like the first defrost at 10:00 AM. To accomplish this, use the **“PROGRAM REVIEW”** button to scroll to ***dFS***. Use the **“SELECTOR”** switch to select 2 hours delay start, then press **“ENTER”**. The first defrost will now occur at 10:00 AM and then a defrost will occur every 6 hours thereafter.

DEFROST SCHEDULE IN MEMORY
Beacon II does not have a real time clock but it keeps track of the time that has elapsed in its memory. It also keeps in memory the number of defrosts scheduled and how much time has elapsed between defrosts. If a power failure occurs, when power is restored Beacon II will remember how many defrosts are scheduled and it will remember how much time was left until the next defrost. It will then defrost based on this timing. So, if the power failure lasted 15 minutes, the defrost schedule will be off by 15 minutes.

ELECTRIC DEFROST MODE
When a defrost is initiated, the EEV closes, the compressor is allowed to pumpdown and shut off. The evaporator fans are cycled off and the defrost heaters are energized.

There is a 2-minute condensate drain-down period after which the compressor is started for a refreeze period. The evaporator fan stays off (fan delay). The refreeze period will last until the evaporator suction temperature is at 28°F or 2 minutes has elapsed. After this sequence, the system is back in the refrigerating mode and the evaporators’ fans are not running.

AIR DEFROST MODE
The sequence is the same as for electric defrost except that there are no heaters and the evaporator fans run continuously.

Alarms

Beacon II provides a set of dry contacts for use in signaling an alarm. These contacts can be connected to a light, a buzzer, a bell, etc., which will be activated when an alarm condition occurs. When the Beacon II is energized, the alarm contacts are OPENED. When an alarm condition is detected, the contacts are CLOSED.

Conditions under which the alarm contacts will close are:

- High Box Temperature – LED Display: ***A1*** – Room temperature has exceeded the Alarm High ***ALH*** value for the Alarm time ***ALt***, programmed.
- Low Box Temperature – LED Display: ***A2*** – Room temperature has dropped below the Alarm Low ***ALL*** value for the Alarm time ***ALt***, programmed.
- System Start-Up Failure – LED Display: ***A3*** – Compressor does not start after three tries. Four minutes between each try.
- Input Fault – LED Display: ***A4*** – Box Temp., Suction Temp., Pressure Transducer open or not installed.
- Power Failure – Loss of power to the Evaporator.

ALARM CODES

A1	High Box Temp	
A2	Low Box Temp	
A3	System Start-Up Failure	Compressor does not start after 3 times. (Four minutes between each try)
A4	Input Fault	Box Temp., Suction Temp., Pressure Transducer open or not installed

Clearing Alarms

Alarms A1 - High Box Temp. and A2 - Low Box Temp. will clear automatically if the Box Temperature decreases or increases to below or above the Alarm set-point temperature. Placing the system in the “Service mode or turning off power will clear the A3 Alarm. Replacing the Room Sensor, Suction sensor, or Pressure Transducer will clear the A4 Alarm.

Error Indicator LED

At initial power up, each Beacon II board checks for system errors. The system error check involves checking the various temperature sensors to determine whether any of these sensors are shorted or open.

The system will pumpdown and cycle off and **will not restart** until the fault is cleared or the circuit breaker reset, for the following conditions:

– Suction sensor shorted, open or not installed
– Room temperature sensor shorted or not installed
– Pressure Transducer open or not installed

The system will pumpdown, cycle off and **try to restart for three consecutive times**. Each try will be after the 4 minutes “Hold Off” period, for the following fault conditions:

– Superheat too low
– High pressure or low pressure cutout
– Oil pressure

After the third try, the system will shut down and not try to restart. The Alarm contacts will be closed and an alarm message displayed on the LED.

ERROR CODES

E1 – Room temperature sensor shorted, open or not installed
E2 – Defrost temperature sensor shorted, open or not installed
E3 – Suction temperature sensor shorted, open or not installed
E4 – Suction pressure transducer shorted, open or not installed
E5 – Outdoor temperature sensor shorted
E6 – Low superheat
E7 – Compressor shut down (high or low pressure switch open or oil pressure switch open).
E9 – Multi-in / multi-out wiring error

Evaporator Fans Shut Off

In some installations, it is desirable to shut off the evaporator fans periodically. This is easily accomplished on Beacon II by wiring a single pole, single throw switch (SPST) between the terminals marked “SERVICE” and “COM” on the Beacon II board. Closing this switch will cause the system to pumpdown and shut off. Air defrost fan motors must be wired through the fan relay on the Beacon II board for this to be effective on air defrost systems. The entire system will be shut off and remain off until the SPST switch is opened.

Air defrost evaporator fans are setup to run constantly. If there is a need to shut down the evaporator fans on an air defrost system, it can be accomplished by wiring the evaporator fan motor or evaporator fan motor contactor through the fan relay on the Beacon II board. When this is done and the air defrost system is placed in “SERVICE” the evaporator fans will shut off when the system is in pumpdown.

Power Failures

In the event of a power failure, Beacon II will automatically close the expansion valve to prevent refrigerant from migrating throughout the system. After power returns, with 24 VAC at the board, the system will restart in the cooling mode after the 4-minute hold off period.

Spare Sensor Terminals

Beacon II provides a set of input terminals for customers who may want to monitor an additional temperature or items such as Product Temperature. This input terminal requires a signal from a thermistor which meets the temperature/resistance values in Table 4 below.

If a product temperature simulator is used, it must meet the resistance/temperature specification listed in Table 4 below. The temperature range for this input is -30°F to 140°F. Sensors on the Beacon II system, as supplied, will not simulate product temperature.

This input can be monitored on the LED display by using the “MONITOR” button and scrolling the ***SPt***. The values displayed will be the temperature of the spare sensor.

Checking Sensors

DO NOT REMOVE SENSORS FROM EVAPORATOR FOR CHECKING.

Use the monitor button to display the value the sensors are reading on the LED (suction temp. SCt, defrost temp. dFt or room temp.). Compare this value to the measured value with a thermometer at each of these points. If they do not match, change the sensor.

or

The sensors can be checked for their proper operation by placing it in a cup of ice water. Stir the ice water and measure the resistance of the sensor. At 32°F the resistance should be 32,650 ohms. If it is higher or lower by 5,000 ohms approximately, the sensor should be replaced.

Resistance of sensors at various temperatures.

Table 4. Resistance / Temperature Specification

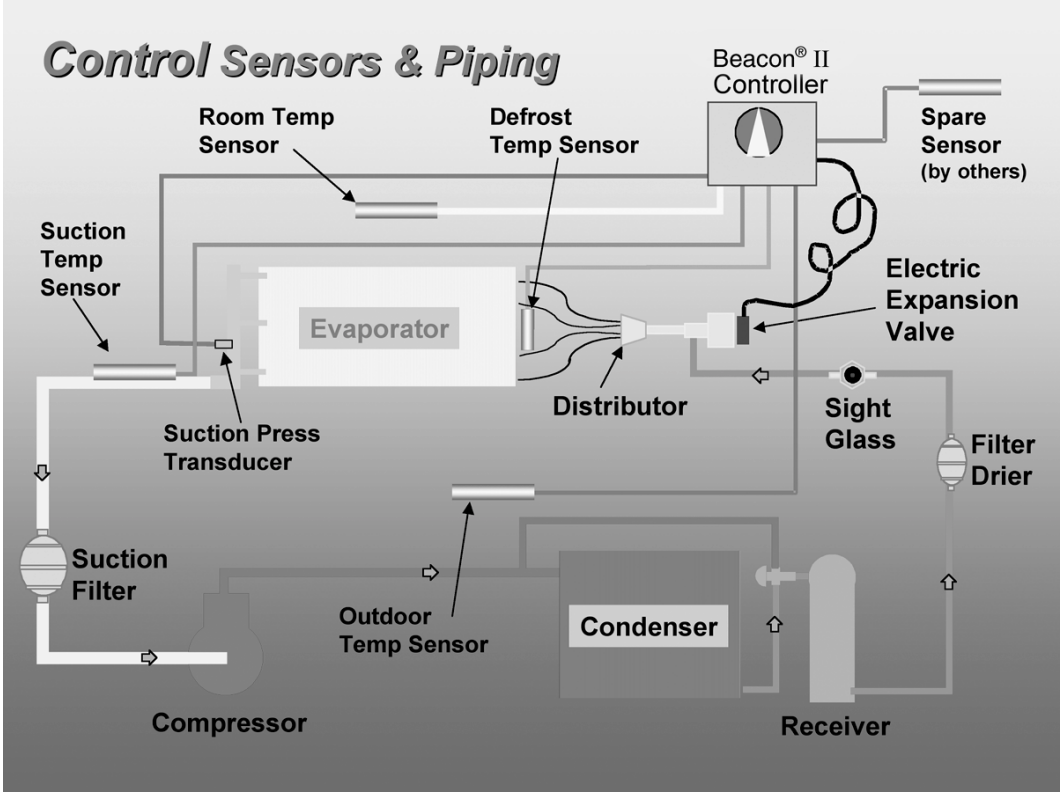
Temperature °F	Ohms	Temperature °F	Ohms
104	5,320	32	32,650
86	8,060	23	42,330
77	10,000	14	55,330
68	12,490	5	72,950
59	15,710	-4	97,070
50	19,900	-13	130,410
41	25,400	-22	176,960

System Defaults

Table 5. System Defaults

Parameters	Code	Air	Electric
Refrigerant	***rEF***	R22	R404A
Box Temperature	***bot***	35°F	-10°F
Superheat	***SUP***	8°F	8°F
Slave Evaporator	***SLA***	No	No
No. of Defrosts Per Day	***dFn***	2	4
Defrost Fail-Safe Time	***dFF***	40 min.	30 min.
Defrost End Temperature	***dFt***	45°F	60°F
Defrost Delay Start Time	***dFS***	0 hrs.	0 hrs.
Alarm High Temperature	***ALH***	50°F	5°F
Alarm Low Temperature	***ALL***	30°F	-15°F
Alarm Time	***ALt***	60 min.	60 min.
Temperature Units	***F-C***	°F	°F

Figure 15. Control Sensor And Piping



Checking Operation Of Expansion Valve (EEV)

To check if the expansion valve is closing properly;

Install a pressure gauge-set to suction line at the condensing unit. With the system running, close the valve on the liquid line, at the condensing unit. The system should pump-down and shut off on the Low Pressure switch (LPS). If the system does not pump-down and trip on the LPS then the compressor valves are weak and needs to be changed.

After the system pumps-down and trip on the LPS, turn off the power to the Beacon II board, then turn the power back on. This will cause the Expansion valve to close.

Open the valve on the liquid line, at the condensing unit. The suction pressure reading on the gauge set should not increase. If the suction pressure increases then the expansion valve is leaking and should be changed.

The expansion valve position can be monitored from the LED display pressing the **"MONITOR"** button and scrolling to ***ESP***. This will indicate the number of steps the valve is open.

This can also be checked by using the EXV test pins on the board. This is indicated by a 0 to 5 Volts DC signa. At 0 Volt the valve is closed and at 5 Volts the valve is fully open. At values between 0 and 5 Volt, the valve will be opened proportionately.

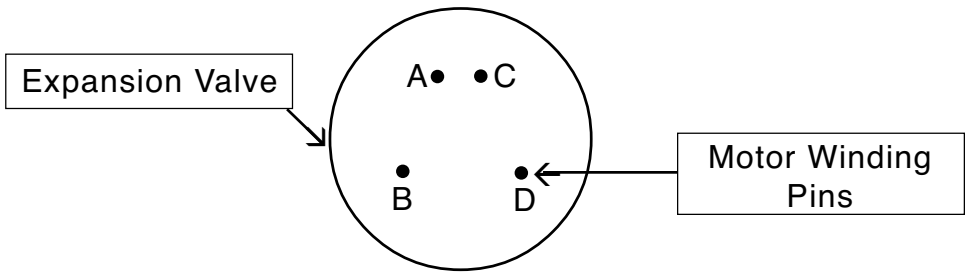
Use the "MONITOR" button to display ***"SCP"*** Evaporator Suction Pressure. Record the pressure displayed. Start the system and observe the pressure displayed. If the pressure does not increase, the expansion valve could be defective.

If the system is running, use the ***"MONITOR"*** button to display ***"SCP"*** Evaporator Suction Pressure. Record the pressure displayed. While the system is running, press the ***"FORCE SERVICE"*** button. Observe the pressure while the system is pumping down. The pressure should decrease. If it does not, this indicates a defective valve.

Expansion Valve Motor Winding Resistance

If the expansion valve is suspected of not functioning properly the motor windings resistance should be measured. This is a bipolar motor with two windings. Measure the resistance at the pins, on top of the valve, between locations A and B or C and D. (Note that the pins are not labeled A, B, C, D. This labeling is just for reference. Also, two of the pins, at location B and location D, have a wider spacing between them than between location A and C.)

Figure 16.



For valve sizes 29320003 and 29320004, the resistance measured between pin locations A and B or C and D should be approximately 336 Ohms when the valve is at 75°F.

For valve sizes 29320007, 29320008, 29320013, and 29320014, the resistance measured between pin locations A and B or C and D should be approximately 116 Ohms when valve is at 75°F.

Measuring resistance between locations A and C or B and D will always show "Open" because these locations are between the motor windings.

When the valve is opening or closing, the voltage measured between A and B or C and D should be between 20 to 22 VAC.

Measuring the DC volt of the EXV TEST pins, on the board, will also indicate if the expansion valve is open or close. 0 volts DC indicates the valve us closed, 5 volts DC indicates the valve is fully open. A Values between 0 and 5 volts indicates how much the valve is open or close.

Refrigeration Charging

1. Install a liquid line drier in the refrigerant supply line between the service gauge and the liquid service port of the receiver. This extra drier will insure that all refrigerant supplied to the system is clean and dry.

2. When initially charging a system that is in a vacuum, liquid refrigerant can be added directly into the receiver tank to break the vacuum. Weighing in the charge is recommended with the initial charge consisting of approximately 2 pounds per system compressor horsepower.

3. Remove the refrigerant drum and connect it to the suction side of the compressor to charge with refrigerant vapor into the low side of the system until the pressure is above atmospheric.

4. Start the system and finish charging until the sight glass indicates a full charge and the proper amount has been weighed in (a total of 4 to 5 pounds per system compressor horsepower).

5. If refrigerant must be added to the system through the suction side of the compressor, charge in vapor form only. Liquid charging must be done in the high side only or with liquid metering devices to protect the compressor.

> **Note:** Maximum refrigerant charge for the cooler system should not exceed 20# (R-22). Maximum refrigerant charge for the freezer systems should not to exceed 10# (R404A).

Check-Out & Start-Up

After the installation has been completed, the following points should be covered before the system is placed in operation:
(a) Check all electrical and refrigerant connections. Be sure they are all correct and tight.
(b) Check voltage taps on transformer. The transformer is shipped wired to 240 voltage tap/connection. If your supply voltage is 208 volt systems, change to 208 voltage tap.
(b) Check setting of time delay relay for low pressure switch in condensing unit. It should be set at two minutes (the third marker).
(c) Check high and low pressure controls, pressure regulating valves, oil pressure safety controls, and all other safety controls and adjust them, if necessary.
(d) On freezers only, check the low pressure switch setting. It must be set to 0 PSIG cut out, 10 PSIG cut in, to allow start and operation, especially in cold ambients.
(e) Liquid line should always be insulated.
(f) Wiring diagrams, instruction bulletins, etc. attached to the condensing units should be read and filed for future reference.
(g) All fan motors on air cooled condensers, evaporators, etc. should be checked for proper rotation. Fan motor mounts should be carefully checked for tightness and proper alignment.
(h) Observe system pressures during charging and initial operation. Do not add oil while the system is short of refrigerant unless oil level is dangerously low.
(i) Continue charging until system has sufficient refrigerant for proper operation. Do not overcharge. Remember that bubbles in a sight glass may be caused by a restriction as well as a shortage of refrigerant.
(j) Do not leave unit unattended until the system has reached normal operating conditions and the oil charge has been properly adjusted to maintain the oil level at the center of the sight glass.
(k) At initial start-up, the system may cycle off at 2 minutes and display a low superheat error, then restart itself. This cycle may be repeated a few times. Do not shut the system off. Let the system run, as it may take a few cycles for the electric expansion valve to attain the correct setting for the desired superheat.

> **CAUTION**: Extreme care must be taken in starting compressors for the first time after system charging. At this time, all of the oil and most of the refrigerant might be in the compressor creating a condition which could cause compressor damage due to slugging. Activating the crankcase heater for 24 hours prior to start-up is recommended. If no crankcase heater is present, then directing a 500 watt heat lamp or other safe heat source on the lower shell of the compressor for approximately thirty minutes will be beneficial in eliminating this condition which might never reoccur.

Operational Checkout

After the system has been charged and has operated for at least 2 hours at normal operating conditions without any indication of malfunction, it should be allowed to operate overnight on automatic controls. Then a thorough re-check of the entire system operation should be made as follows:

(a) Check compressor discharge and suction pressures. If not within system design limits, determine why and take corrective action.
(b) Check liquid line sight glass and expansion valve operation. If there are indications that more refrigerant is required, leak test all connections and system components and repair any leaks before adding refrigerant.
(c) Using suitable instruments, carefully check line voltage and amperage at the compressor terminals. Voltage must be within 10% of that indicated on the condensing unit nameplate. If high or low voltage is indicated, notify the power company. If amperage draw is excessive, immediately determine the cause and take corrective action. On 3 phase motor compressors, check to see that a balanced load is drawn by each phase.
(d) The maximum approved settings for high pressure controls on Heatcraft air cooled condensing equipment is 400 psig. On air cooled systems, check as follows:
- Disconnect the fan motors or block the condenser inlet air.
- Watch high pressure gauge for cutout point.
- Re-check all safety & operating controls for proper operation and adjust if necessary.

(e) Check head pressure controls for pressure setting.
(f) Check crankcase heater operation if used.
(g) Install instruction card and control system diagram for use of building manager or owner.

System Balancing

IMPORTANT: In order to obtain the maximum capacity from a system, and to ensure trouble-free operation, it is essential to balance each and every system.

The critical value to be checked here is suction superheat at the compressor:
1. Measure the suction pressure at the suction service valve of the compressor and determine the saturation temperature corresponding to this pressure from a “Temperature-Pressure” chart.
2. Measure the suction temperature of the suction line about one foot back from the compressor using an accurate thermometer.
3. Subtract the saturated temperature from the actual suction line temperature. The difference is superheat.

Too low a suction superheat can result in liquid being returned to the compressor. This will cause dilution of the oil and eventual failure of the bearings and rings or in the extreme case, valve failure or even “slugging” of the compressor.

Too high a suction superheat will result in excessive discharge temperatures which causes a break down of the oil and results in piston ring wear, piston and cylinder wall damage.

It should also be remembered that the system capacity decreases as the suction superheat increases. For maximum system capacity, suction superheat should be kept as low as is practical. Copeland mandates a minimum superheat of 20ºF and a maximum of 45ºF at the compressor. Heatcraft recommends a superheat of 30ºF.

Adjust the superheat by changing the superheat setting on the board to increase or decrease as needed to obtain desired superheat value at the compressor.

Preventive Maintenance

Routine preventive maintenance of any mechanical equipment is critical to its long term reliability. During even normal operation all equipment will expeerience some deterioration during its lifetime caused by wear and evironmental influences. For that reason, regularly scheduled maintenance of your refrigeration equipment is required in order to keep it operating to its maximum efficiency while avoiding potentially costly repairs of a premature failure due to equipment neglect. The following is Heatcraft's minimum recommendations for regularly scheduled preventive maintenance of your 7-Eleven refrigeration system. Qualified and licensed refrigeration companies only should perform all preventive and corrective maintenance on refrigeration equipment. While we cannot guarantee that close adherence to these recommendations will eliminate all equipment problems, it will greatly reduce the potential for mechanical and electrical failures thus providing increased reliability.

Go to pages 30-31 for the Preventive Maintenance Tables.

CONDENSING UNIT

		QUARTERLY	SEMI-ANNUALLY	DATE	DATE	DATE	DATE
Visually inspect unit		✓	✓				
1	Look for signs of oil stains on interconnection piping and condenser coil. Pay close attention to areas around solder joints, building penetrations and pipe clamps. Check any suspect areas with an electronic leak detector	✓	✓				
2	Check condition of moisture indicator in the sight glass of all systems. Look for indication of moisture or flash gas.	✓	✓				
3	Check condition of condenser. Look for accumulation of dirt and debris. Clean as required.	✓	✓				
4	Check for unusual noise or vibration. Take corrective action as required.	✓	✓				
5	Inspect wiring for signs of wear or discoloration	✓	✓				
Clean condenser coil and blades			✓				
1	Periodic cleaning can be accomplished by using a brush, pressurized water and a commercially available foam coil cleaner. If foam cleaner is used, it should not be an acid based cleaner. Follow label directions for appropriate use		✓				
2	Rinse until no residue remains		✓				
Check operation of condenser fans			✓				
1	Check that each fan rotates freely and quietly. Replace any fan motor that does not rotate smoothly or makes excessive noise.		✓				
2	Check all fan blade set screws and tighten as required		✓				
3	Check all fan blades for signs of cracks, wear or stress. Pay close attention to the hub and spider. Replace blades as required.		✓				
4	Verify that all motors are mounted securely		✓				
Inspect electrical wiring and components			✓				
1	Verify that all electrical and ground connections are secure, tighten as required.		✓				
2	Check condition of compressor, defrost heater and condenser fan contactors. Look for discoloration and pitting. Replace as required		✓				
3	Check operation and calibration of all timers, relays pressure controls and safety controls		✓				
4	Clean electrical cabinet. Look for signs of moisture, dirt, debris, insects and wildlife. Take corrective action as required		✓				
5	Verify operation of crankcase heaters by measuring amp draw		✓				
Check refrigeration cycle for all systems			✓				
1	Check suction and discharge temperatures & pressures. If abnormal take appropriate action		✓				
2	Verify that superheat at the compressor conforms to specification. (30F to 45F)		✓				
Inspect suction accumulators			✓				
1	Inspect all accumulators for signs of leaks and corrosion.		✓				
2	Pay close attention to all copper to steel brazed connections		✓				
3	Wire brush all corroded areas and peeling paint.		✓				
4	Apply an anticorrosion primer and paint as required.		✓				

UNIT COOLERS

		QUARTERLY	SEMI-ANNUALLY	DATE	DATE	DATE	DATE
Visually inspect unit		✓	✓				
1	Look for signs of corrosion on fins, cabinet, copper tubing and solder joints	✓	✓				
2	Look for excessive or unusual vibration for fan blades or sheet metal panels when in operation. Identify fan cell(s) causing vibration and check motor and blade carefully.	✓	✓				
3	Look for oil stains on headers, return bends, and coil fins. Check any suspect areas with an electronic leak detector.	✓	✓				
4	Check drain pan to insure that drain is clear of debris, obstructions or ice build-up and is free draining	✓	✓				
5	Insure that there is sufficient clearance free of obstructions around unit coolers to allow proper airflow through coils	✓	✓				
6	Verify Box setpoint temperature is being met	✓	✓				
Clean Evaporator coil and blades			✓				
1	Periodic cleaning can be accomplished by using a brush, pressurized water or a commercially available Evaporator Coil Cleaner or mild detergent. **Never** use an acid based cleaner. Always follow label directions for appropriate use. Be sure the product you use is approved for use in food service applications.		✓				
2	Flush and rinse coil until no residue remains.		✓				
3	Pay close attention to drain pan, drain line and trap.						
Check the operation of all fans and ensure airflow is unobstructed			✓				
1	Check that each fan rotates freely and quietly. Replace any fan motor that does not rotate smoothly or makes an unusual noise.		✓				
2	Check all fan set screws and tighten if needed.		✓				
3	Check all fan blades for signs of stress or wear. Replace any blades that are worn, cracked or bent.		✓				
4	Verify that all fan motors are securely fastened.		✓				
Inspect electrical wiring and components			✓				
1	Visually inspect all wiring for wear, kinks, bare areas and discoloration. Replace any wiring found to be damaged		✓				
2	Verify that all electrical and ground connections are secure, tighten if necessary.		✓				
3	Check operation/calibration of all fan cycle and defrost controls when used.		✓				
4	Look for abnormal accumulation of ice patterns and adjust defrost cycles accordingly		✓				
5	Compare actual defrost heater amp draw against unit data plate. (freezer only)		✓				
6	Visually inspect heaters to ensure even surface contact with the coil. If heaters have creeped decrease defrost termination temperature and be sure you have even coil frost patterns. (freezer only)		✓				
7	Check low voltage wiring at Beacon board for broken wires		✓				
8	Check voltage at Beacon board. Should be between 18 to 30 Volts		✓				
Check Beacon sensors			✓				
1	Press MONITOR button to display sensor reading for Box Temp., Suction Temp. and Defrost Temp.		✓				
2	Use an accurate Thermometer to measure temperatures at the same locations as the sensors.		✓				
3	LED readings should match measured values, within 3 °F at same locations as sensors.		✓				
Check Beacon Pressure Transducer			✓				
1	Press MONITOR button to display Suction Pressure reading at the Evaporator		✓				
2	Use an accurate Gauge Set to measure Evaporator Pressure.		✓				
3	Measured suction pressure should match LED displayed value within 2 Psig.		✓				
Drain Line Heater			✓				
1	Check heater amps		✓				
2	Check that heater is wrapped around entire length of drain line inside the walk-in freezer		✓				
Refrigeration Cycle			✓				
1	Check unit cooler superheat and compare reading for your specific application		✓				
2	Visually inspect coil for even refrigerant distribution		✓				

Beacon II Troubleshooting Guide

PROBLEM	Step	ACTION ITEM	IF OK	IF NOT OK
LED is not lit.	1.	Check Primary Power Supply Disconnect	Go to next step	1. Check fuses and circuit breakers
	2.	Check Voltage to Evaporator Transformer		2. Check field wiring for breaks
	3.	Check Transformer Secondary Output Volts		3. Replace if necessary
	4.	Check Voltage at Control Board (24V and C)		4. Check factory wiring and connections
	5.	Replace Control Board		
LED shows ***Coo***, but compressor will not run.	1.	Check Compressor internal overloads	Go to next step	1. Wait for reset
	2.	Check Control Power to Condensing Unit (24 Volts across "COMP" and "C" at board)		2. Check transformer voltage (secondary and primary) and wiring of 208V power taps.
	3.	Check Compressor Contactor Coil Voltage		3. Check internal condensing unit wiring
	4.	Check Compressor Contactor "pulled in"		4. Replace as needed
ERROR CODES:				
E1 Room Sensor		Check Sensor and Board Connection		Replace as needed
E2 Defrost Sensor		Check Sensor and Board Connection		Replace as needed
E3 Suction Sensor		Check Sensor and Board Connection		Replace as needed
E4 Suction Transducer		Check Transducer and Board Connection		Replace as needed
E5 Outdoor Sensor		Check Sensor, wiring and Board Connection		Replace or remove
E6 **Low Superheat During Cooling** (0°F for 2 minutes)	1.	Check Refrigerant Type	Go to next step	1. Compare board setpoint and refrigerant
	2.	Check coil for ice		2. Defrost coil and check defrost cycle settings/setpoints, defrost sensor and heater amps.
	3.	Check Control Board step position from board LED		3. Replace board if EEV steps not at 2.
	4.	Check Electric Expansion Valve Closure		4. Pumpdown system see if LPS opens or if it times out (EEV is bad or LPS is set incorrectly, if times out) – See Pumpdown.
	5.	Compressor Not Operating		5. Check overloads and contactor.
	6.	Check Suction Temperature Sensor		6. Compare board sensor reading against actual suction line temperature.
	7.	Check Suction Pressure Transducer		7. Compare pressure reading against gauges.

Beacon II Troubleshooting Guide (continued)

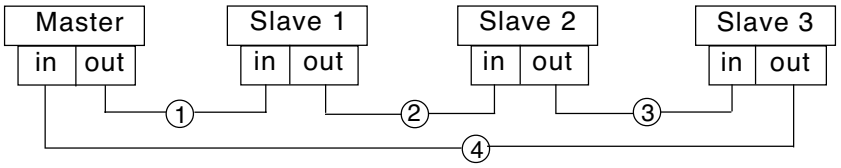
PROBLEM	Step	ACTION ITEM	IF OK	IF NOT OK
***E7* Compressor Shutdown**	1.	Check wiring connection to the board		• Correct field wiring to the board
	2.	Low Pressure Safety (LPS) Tripped:		
		• Check for correct refrigerant type		• Change setpoint to match refrigerant
		• Check refrigerant charge		• Add more refrigerant to proper charge
		• Check LPS setting		• Correct LPS setting
		• Check LPS wiring		• Correct LSP wiring
		• Check EEV operation (stuck?)		• Clean or replace EEV
		• Check coil for icing		• Defrost coil (see *E6*, step 2)
		• Check for correct superheat reading		• Check/replace sensor or transducer
		• Check for correct nozzle selection		• Replace distributor nozzle
		• Check for clogged EEV inlet screen		• Replace EEV
		• Check line sizing		• Correct line sizing
		• Check LPS time delay relay setting		• Reset to 1 minute
		• Check operation of LPS		• Replace Low Pressure Safety Switch
	3.	High Pressure Safety (HPS) Tripped:		
		• Check for system overcharge		• Reclaim/recover excess charge
		• Check for non-condensables		• Remove all non-condensables
		• Check condenser fan motor and blade		• Repair or replace motor and/or blade
		• Check for dirty condenser coil		• Clean condenser coil
		• Check head pressure controls		• Adjust or replace faulty controls
		• Check fan cycling controls		• Adjust or replace faulty controls
		• Check liquid line sizing		• Correct line sizing
		• Check for liquid line restrictions		• Repair line or remove restrictions
		• Check operation of HPS		• Replace HPS if necessary
	4.	Oil Pressure Safety (OPS) Tripped:		
		• Check oil level in compressor		• Add oil to crankcase to minimum level
		• Check oil sump screen pickup		• Clean or replace pickup screen
		• Check oil pump pressure		• Replace compressor oil pump
		• Check for proper piping practices	Go to	• Correct piping to minimize oil logging
		• Check for low superheat (see *E6*)	next step	• Correct per steps in *E6*
		• Check operation of auxiliary relay (R6)		• Replace auxiliary relay
		• Check OPS sensor		• Replace faulty OPS sensor
		• Check operation of OPS		• Replace faulty OPS
	5.	Compressor Module Tripped (when supplied):		
		• Check module		• Replace faulty module
		• Check superheat at compressor inlet		• Reduce superheat (TXV adjust, etc.)
		• Check compressor for overheating		• Correct overheating problem
		• Check suction pressure (too low?)		• Consider crankcase pressure regulator or other measures
	6.	Phase Loss Monitor (PLM) Tripped:		
		• Check presence of all phase legs		• Correct power phase problem
		• Check power supply		• Correct power supply problems
		• Check operation of PLM		• Replace faulty PLM
	7.	Demand Cooling (when supplied):		
		• Check auxiliary relay		• Replace auxiliary relay
		• Check demand cooling device		• Replace faulty demand cooling device
	8.	Check compressor relay on board		• Replace board if relay is faulty

Beacon II Troubleshooting Guide (continued)

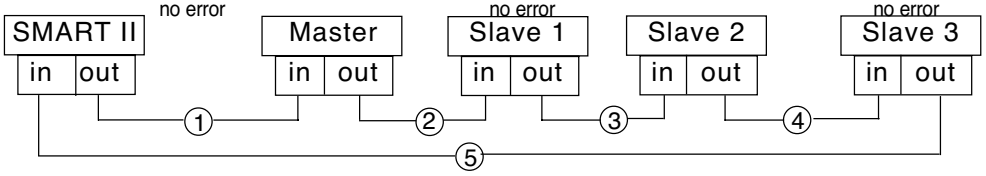
PROBLEM	Step	ACTION ITEM	IF OK	IF NOT OK
E9 **Multi-out to Multi-in Communication Wiring (only shows after initial successful connection)**	1.	Check for 24 volts power to the board		1. If no voltage, see "LED is not lit" above for low voltage, see "88888 LED display"
	2.	Check for crossed communication wiring (multi-out not wired to multi-in terminals)	Go to next step	2. Correct wiring from "Master" unit Multi-out to Multi-in of "Slave" unit, etc. to all Slaves and return to Master. (See wiring diagrams)
	3.	Check for broken communication wiring		3. Correct wiring between first Slave with error to previous board in the sequence.

(E9 continued)
Communication Error Occurrence:

Break in the designated lines will cause errors as follows:



Line #	Master	Slave1	Slave 2	Slave 3
1	E9	E9	E9	E9
2	E9	no error	E9	E9
3	E9	no error	no error	E9
4	E9	no error	no error	no error



[With SMART Controller II]

Line #	SMART	Master	Slave1	Slave 2	Slave 3
1	+COMM+	E9	no error	no error	no error
2	+COMM+	no error	E9	E9	E9
3	+COMM+	no error	no error	E9	E9
4	+COMM+	no error	no error	no error	E9
5	+COMM+	no error	no error	no error	no error

PROBLEM	Step	ACTION ITEM	IF OK	IF NOT OK
88888 LED display (power is below 18V and appears at initial power)	1.	Check Voltage to Evaporator Transformer		1. Check field wiring for breaks or shorts
	2.	Check Transformer Secondary Output Volts	Go to	2. Replace if necessary
	3.	Check Voltage at Control Board (24 and C)	next step	3. Check factory wiring and connections
	4.	Check Voltage at SMART Controller II		4. Check field wiring from board
LED displays ***dLy*** then ***oFF*** with no displayed errors	1.	Check for low voltage		1. Check all steps for "88888 LED display" Voltage could drop off too fast to show.
	2.	Check for short in field wiring from "comp" on board to condensing unit terminal connection	Go to next step.	2. Check internal factory wiring to compressor contactor.
	3.	Replace defective contactor (holding coil)		

Beacon II Troubleshooting Guide (continued)

PROBLEM	Step	ACTION ITEM	IF OK	IF NOT OK
Cannot get to box temperature	1.	Check system operation: Is it running?		1. Check power to condensing unit Check position of Service Mode switches Check compressor overloads and contactor
	2.	Check system charge		2. Add or remove refrigerant to proper charge
	3.	Check for proper operating superheat		3. Check EEV operation Check control board EEV signal Check suction sensor and transducer
	4.	Check for high superheat and EEV wide open		4. Check EEV inlet screen and restrictions Check liquid line sizing Check head pressure controls
	5.	Check Low Pressure Safety Switch		5. Check everything for E7 LPS above
	6.	Compare equipment capacity with requirements	Go to	6. Add or replace with more/larger equipment
	7.	Check box temperature setpoint	next step	7. Correct setpoint to proper value
	8.	Check compressor performance		8. Check compressor application limitations Check integrity of compressor operation (impaired, worn or damaged components)
	9.	Check condenser coil for dirt/debris		9. Clean condenser coil
	10.	Check condenser for non-condensables		10. Remove all non-condensables
	11.	Check condenser fan operation		11. Replace/repair fan blade, motor, cycling switch or make corrective adjustments.
	12.	Check for correct refrigerant type		12. Compare board setpoint and refrigerant
	13.	Check for iced evaporator coil		13. Defrost coil and check defrost cycle (see E2) settings/setpoints and defrost sensor
	14.	Check defrost parameters		14. Correct defrost setpoints in program (frequency and termination of defrosts)
	15.	Check superheat setpoint (too high?)		15. Correct setpoint for more cooling surface
	16.	Check display values (°F or °C)		16. Correct setpoint for proper display values

		Placing system into SERVICE MODE (BOARDS ONLY)	**Terminating SERVICE MODE** (BOARDS ONLY)
Service Mode (***SEr*** is displayed)	1.	Use Remote Service Switch in condensing unit	1. Must terminate using same switch
	2.	Pressing “Force Service” button board* twice	2. Press “Clear” button on board
	3.	Connection between “Ser” and “C” on board* (all are wired in parallel; all will activate mode) *ONLY Master board on multiple evaporator systems	3. Open connection between “Ser” and “C” (Note: If multiple switches were placed in Service Mode, <u>all</u> must be “open” to terminate the mode.)
		(with SMART Controller II)	**(with SMART Controller II)**
	1.	Use Remote Service Switch in condensing unit	1. Must terminate using same switch
	2.	Connection between “Ser” and “C” on board*	2. Open connection between “Ser” and “C”
	3.	From program menu of Smart Controller II, Change SERVICE setpoint to “On”. [all are wired in parallel; any/all will activate mode.] *ONLY Master board on multiple evaporator systems	3. From program menu of Smart Controller II, Change SERVICE setpoint to “Off” [Note: If multiple switches were placed in Service Mode, <u>all</u> must be “open” to terminate the mode.)

Table 6. Beacon II Parts List

PART DESCRIPTION		HRP PART NUMBER
Beacon II Control Board		28910101
*Temperature Sensor Kit – Blue Leads		89904902
Transformer:	240/24 volt – 40 VA	22529602
Pilot Relay		22511401
Contactor for Compressor 40 amp with 24 volt Coil		2252440
Terminal Block – Condensing Unit		2251266
Low Pressure Switch Time Delay Relay		22536801
Electric Expansion Valve:	ESB 4 – 3/8" X 3/8" Conn	29320004
	ESB 10 – 3/8" X 3/8" Conn	29320007
Expansion Valve Molded Connector:	(Bipolar valves)	22515201
Pressure Transducer		28911201
Pressure Transducer Harness		22515101
Beacon SMART CONTROLLER II		89704301
**SMART CONTROLLER Software Package		89704101

* Only the sensor with blue leads is shipped as a Service Replacement Part.
** SMART CONTROLLER Software Package is sold separately.

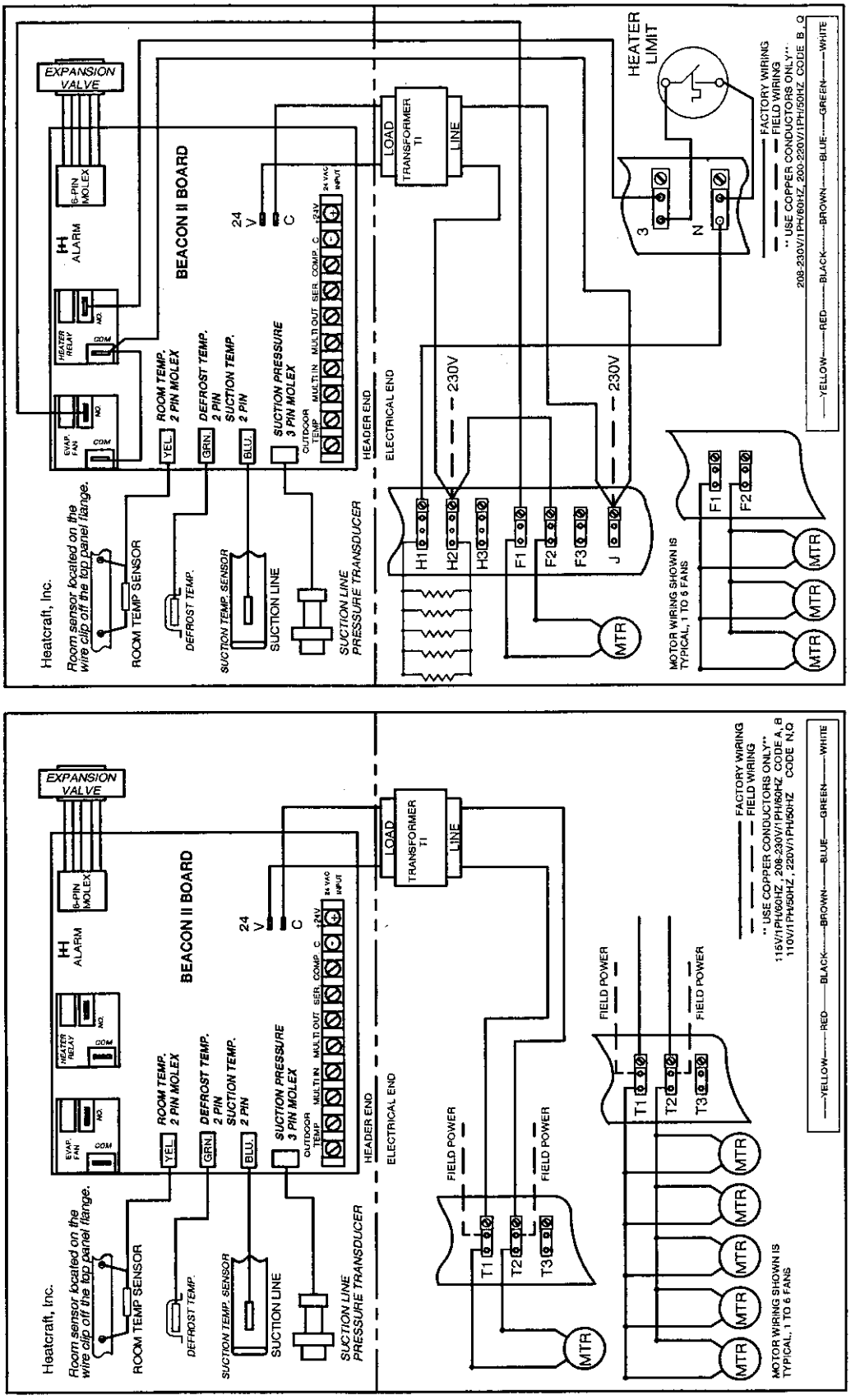
Table 7. Condensing Unit HRP Parts

Part Description	HRP Part Number
Top Panel	35617803
Front Panel (LH)	35617903 LH
Front Panel (RH)	35622803 RH
Fan Motor	2538000
Fan Blade	2293030
Fan Guard	23104201
Fan Contactor (25A 3Ø 240 V)	2259996
Fan Relay 24 V	22511401
Fan Relay 240 V	1007950
Low Pressure Switch	28913401
High Pressure Switch	28913201
Receiver 6" x 27"	27304701
Receiver 6" x 12"	27304702
Compr Contactor (40A 3Ø 24 V)	2252440
Circuit Breaker 40A 3Ø	2253040
Compr Contactor (25A 3Ø 24 V)	2255845
Circuit Breaker 15A 3Ø	2253015
Crankcase Heater	7077982
Compr Contactor (30A 3Ø 24 V)	2254304
Circuit Breaker 15A 2Ø	22536502
Crankcase Heater	24701402

Table 8. Unit Cooler HRP Parts

PART Description	MODEL	Part Number
Fan Motor (PSC208/230)	ADT/LET	25308601
	TL	253303301
Motor Mount	ADT/LET	23103301
	TL	23101401
Fan Blade	ADT/LET	5140C
	TL	23100201
Fan Guard (Molded)	ADT	37000702
	TL	H50328
Expansion Valve	ADT208	29320007
	ADT156	29320004
	ADT130	29320004
	LET047	29320004
	TL53	29320004
Coil Heater	LET047	24752001
	TL53	24700702
Drain Pan Heater	LET047	24752101

Diagram 1.



NOTE: THESE ARE TYPICAL EVAPORATOR WIRING DIAGRAMS.
CONSULT WIRING DIAGRAM SHIPPED ON UNIT FOR ACTUAL UNIT WIRING.

Diagram 2.

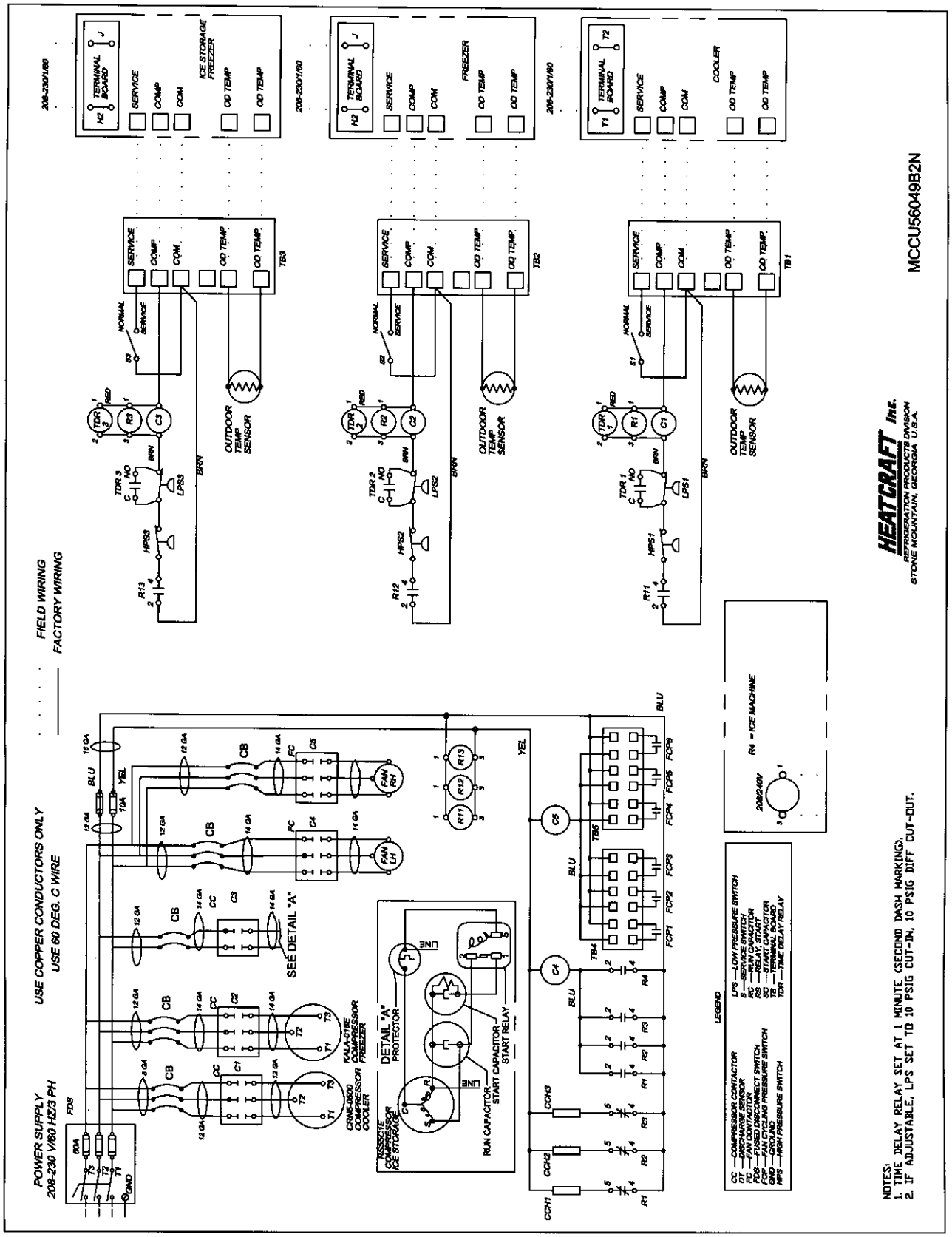

MCCU56049B2N
HEATCRAFT Inc.
REFRIGERATION PRODUCTS DIVISION
STONE MOUNTAIN, GEORGIA U.S.A.
POWER SUPPLY
208-230 V/60 HZ/3 PH
USE COPPER CONDUCTORS ONLY
USE 60 DEG. C WIRE
FIELD WIRING
FACTORY WIRING
ICE STORAGE FREEZER
FREEZER
COOLER
TERMINAL BOARD
SERVICE
COMP
COM
OD TEMP
OUTDOOR TEMP SENSOR
NORMAL
SERVICE
TDR 1
TDR 2
TDR 3
HPS1
HPS2
HPS3
LPS1
LPS2
LPS3
SEE DETAIL "A"
DETAIL "A"
PROTECTOR
START CAPACITOR
START RELAY
RUN CAPACITOR
KALA-DYNE COMPRESSOR FREEZER
CRNA-A550 COMPRESSOR COOLER
R4 = ICE MACHINE
208/240V
LEGEND
CC —COMPRESSOR CONTACTOR
CH —CRANKCASE HEATER
FC —FAN CONTACTOR
FDS —FUSED DISCONNECT SWITCH
FCP —FAN CYCLING PRESSURE SWITCH
LPS —LOW PRESSURE SWITCH
HPS —HIGH PRESSURE SWITCH
LPS —LOW PRESSURE SWITCH
S —SERVICE SWITCH
M —FAN CONTACTOR
RS —RELAY, START
SC —START CAPACITOR
TB —TERMINAL BOARD
TDR —TIME DELAY RELAY
NOTES:
1. TIME DELAY RELAY SET AT 1 MINUTE (SECOND DASH MARKING).
2. IF ADJUSTABLE, LPS SET TO 10 PSIG CUT-IN, 10 PSIG DIFF CUT-OUT.

Diagram 3.

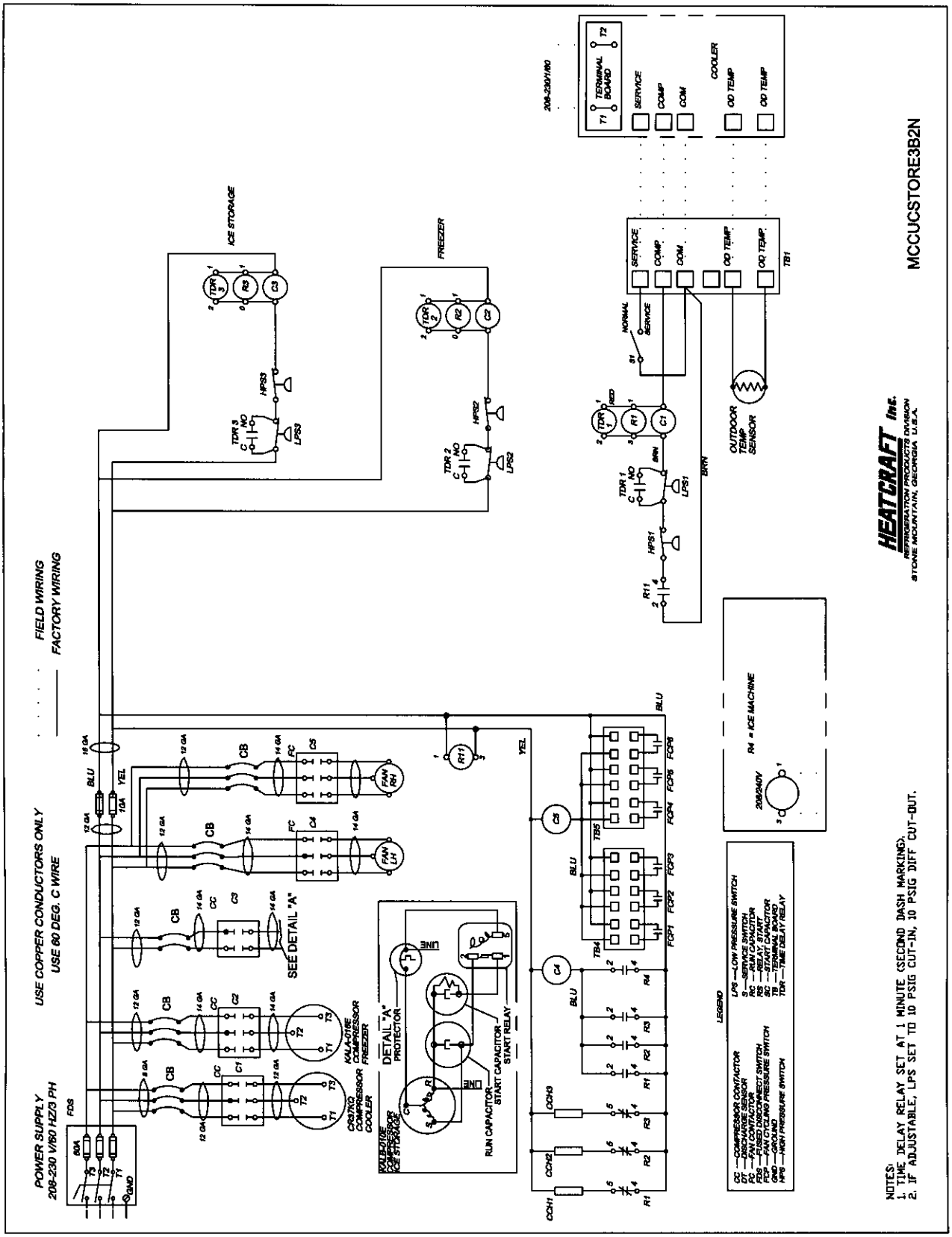
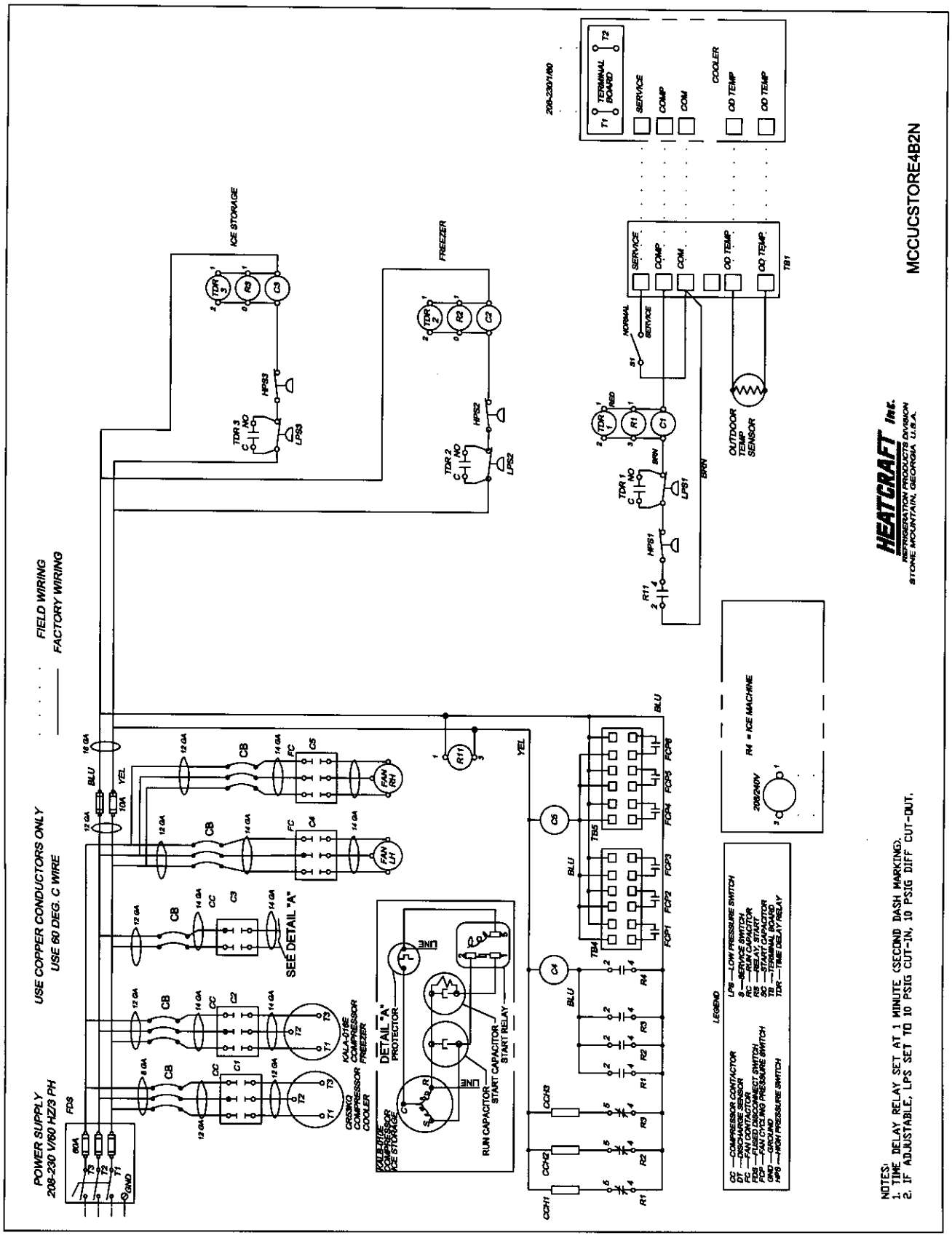

USE COPPER CONDUCTORS ONLY
USE 60 DEG. C WIRE
FIELD WIRING
FACTORY WIRING
POWER SUPPLY
208-230 V/60 HZ/3 PH
MCCUCSTORE3B2N
HEATCRAFT Inc.
REFRIGERATION PRODUCTS DIVISION
STONE MOUNTAIN, GEORGIA U.S.A.
ICE STORAGE
FREEZER
COOLER
SERVICE
COMP
COM
OD TEMP
TERMINAL BOARD
OUTDOOR TEMP SENSOR
SEE DETAIL "A"
DETAIL "A"
PROTECTOR
RUN CAPACITOR
START CAPACITOR
START RELAY
R4 = ICE MACHINE
208/240V
LEGEND
NOTES:
1. TIME DELAY RELAY SET AT 1 MINUTE (SECOND DASH MARKING).
2. IF ADJUSTABLE, LPS SET TO 10 PSIG CUT-IN, 10 PSIG DIFF CUT-OUT.

Diagram 4.


MCCUCSTORE4B2N
HEATCRAFT Inc.
REFRIGERATION PRODUCTS Division
STONE MOUNTAIN, GEORGIA U.S.A.
POWER SUPPLY
208-230 V/60 HZ/3 PH
USE COPPER CONDUCTORS ONLY
USE 60 DEG. C WIRE
FIELD WIRING
FACTORY WIRING
ICE STORAGE
FREEZER
COOLER
SERVICE
COMP
COM
OD TEMP
TERMINAL BOARD
OUTDOOR TEMP SENSOR
NORMAL
SERVICE
SEE DETAIL "A"
DETAIL "A"
PROTECTOR
RUN CAPACITOR
START CAPACITOR
START RELAY
KALA-016E COMPRESSOR FREEZER
CR33KQ COMPRESSOR COOLER
KALA-016E COMPRESSOR ICE STORAGE
R4 = ICE MACHINE
208/240V
LEGEND
NOTES:
1. TIME DELAY RELAY SET AT 1 MINUTE (SECOND DASH MARKING).
2. IF ADJUSTABLE, LPS SET TO 10 PSIG CUT-IN, 10 PSIG DIFF CUT-OUT.

Wiring Diagram

Diagram 5.

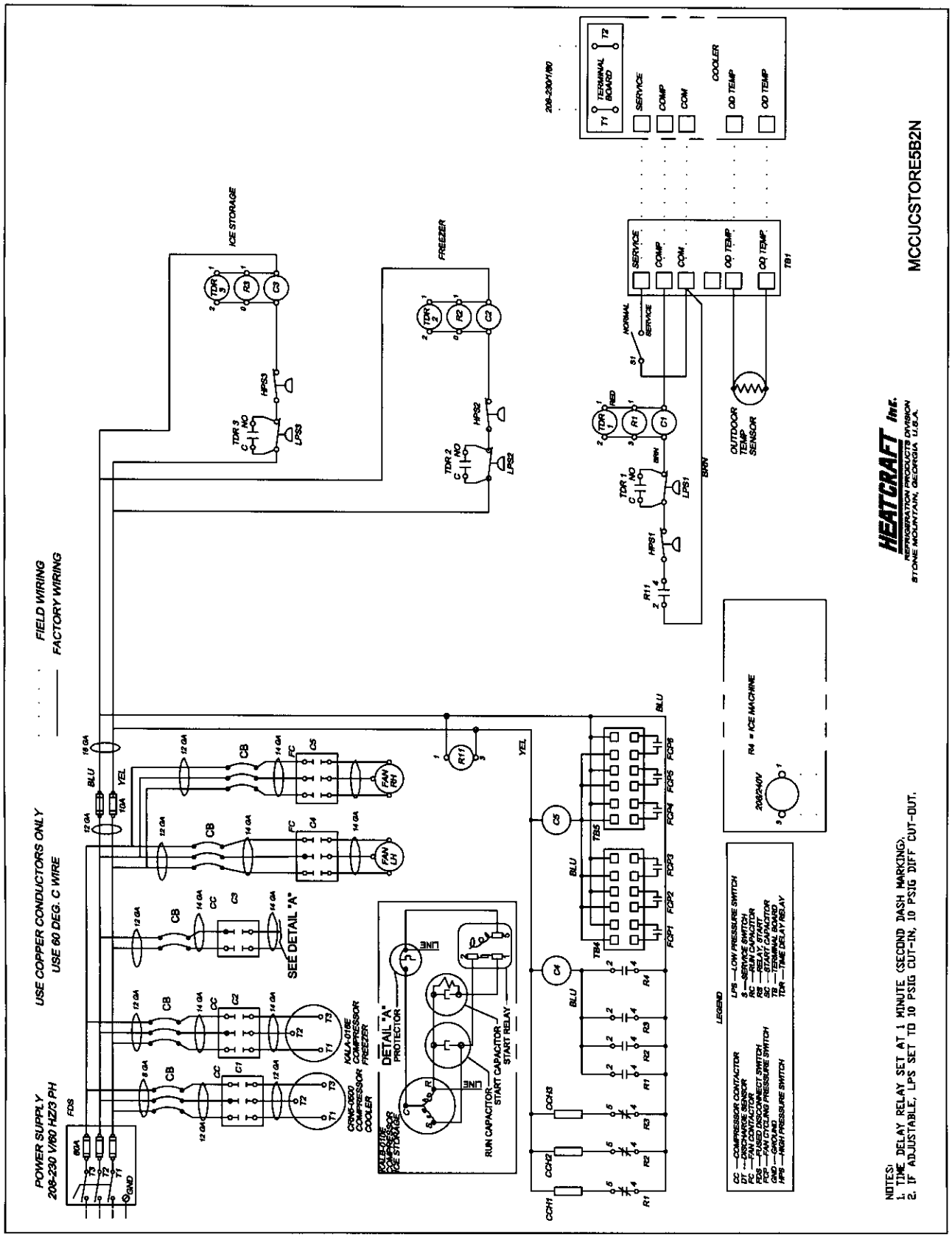
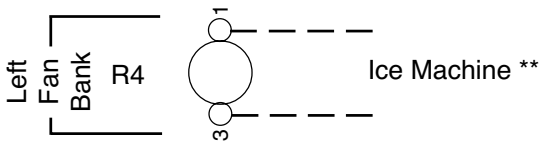


Diagram 1. Ice Machine Fan Cycle Wiring



Fan Cycling Interlocking Connections

Relay 4 (R4) is for condenser fan operation for the Ice Machine circuit located with the left fan. Relay is 208-240V.

Hoshizaki ice machines require a 115 volt relay which must be field supplied replacing the factory relay.

Start-up Checklist

Date of Start-up _____

Location _____

CONDENSING UNIT

MODEL # _____

SERIAL # _____

COOLER UNIT

MODEL # _____

SERIAL # _____

COOLER UNIT

MODEL # _____

SERIAL # _____

COOLER UNIT

MODEL # _____

SERIAL # _____

FREEZER UNIT

MODEL # _____

SERIAL # _____

FREEZER UNIT

MODEL # _____

SERIAL # _____

ELECTRICAL

- Check Primary Supply voltage.
 If 208 V, change transformer wiring in the Cooler and Freezer to the 208 V tap
 ☐YES
- Check Compressor Amps for COOLER and FREEZER compressors. Should match nameplate.
 ☐YES ☐NO

PIPING

- Is suction line trapped at the Cooler?
 ☐YES ☐NO
- Is suction line trapped at the Freezer?
 ☐YES ☐NO

DRAIN LINES

- Are drain lines sloped properly?
 ☐YES ☐NO
- Is drain line trapped outside the Cooler?
 ☐YES ☐NO
- Is drain line trapped outside the Freezer?
 ☐YES ☐NO
- Is heat tape wrapped along entire length of the drain line in the Freezer?
 ☐YES ☐NO
- Is heat tape plugged in and heating the drain line?
 ☐YES ☐NO

INSULATION

- Are Liquid lines fully insulated?
 ☐YES ☐NO
- Are Suction lines fully insulated?
 ☐YES ☐NO

SETTINGS

- Check Beacon II board settings for the following:

FREEZER	
Refrigerant Type	R404A
Box Setpoint Temp.	-10°F.
Superheat	8°F.
No. of Defrost/Day	4
Defrost End Temp.	65°F.

COOLER		ICE STORAGE
Refrigerant Type	R22	R404A
Box Setpoint Temp.	35°F.	28°F.
Superheat	8°F.	8
No. of Defrost/Day	2	4
Defrost End Temp.	50°F.	50°F.

SYSTEM CHECKS

- Check Compressor Superheat for the COOLER (Should be between 20°F. & 30°F.)
 ☐YES ☐NO
- Check Compressor Superheat for the FREEZER (Should be between 20°F. & 30°F.)
 ☐YES ☐NO
 •Force unit into a Defrost Check heater amps. Should match nameplate amps.
 ☐YES ☐NO
- Check LPS Time Delay Relays. Should be set at 1 minute for both the COOLER and FREEZER.
 ☐YES ☐NO
- Check Low Pressure Switch on FREEZER. Should be set at 0 psig Cut-out/10 psig Cut-in.
 ☐YES ☐NO
- Did FREEZER and COOLER cycle off on LPS at Set-point Temperature?
 ☐YES ☐NO
- Is the sight glass free of bubbles?
 ☐YES ☐NO
- Are the COOLER and FREEZER fans at proper speeds?
 ☐YES ☐NO
- Check system for refrigerant leaks. Are there any leaks on the COOLER, FREEZER, CONDENSING UNIT or INTERCONNECTING PIPING?
 ☐YES ☐NO
- Check system piping for unusual vibration or noise. Is there any unusual vibration or noise on the COOLER, FREEZER, CONDENSING UNIT or INTERCONNECTING PIPING?
 ☐YES ☐NO
- Start the FREEZER only. Does the compressor start and evaporator fans run for this FREEZER?
 ☐YES ☐NO

Start-up Checklist

RECORD

OUTDOOR TEMPERATURE _____°F.

SYSTEM VOLTAGE	_____Volts	_____PH	_____PH
Cooler Compressor Amps	_____L1	_____L2	_____L3
Freezer Compressor Amps	_____L1	_____L2	_____L3
Ice Storage Compressor Amps	_____L1	_____L2	_____L3
Cooler Discharge Pressure	_____PSIG		
Freezer Discharge Pressure	_____PSIG		
Ice Storage Discharge Pressure	_____PSIG		
Cooler Suction Pressure	_____PSIG		
Freezer Suction Pressure	_____PSIG		
Ice Storage Suction Pressure	_____PSIG		
Cooler Suction Temp.	_____°F.		
Freezer Suction Temp.	_____°F.		
Ice Storage Suction Temp.	_____°F.		
Cooler Refrigerant Charge	_____lbs.		
Freezer Refrigerant Charge	_____lbs.		
Ice Storage Refrigerant Charge	_____lbs.		
Cooler Compressor Superheat	_____°F.		
Freezer Compressor Superheat	_____°F.		
Ice Storage Compressor Superheat	_____°F.		
Cooler Evaporator Superheat	_____°F.		
Freezer Evaporator Superheat	_____°F.		
Ice Storage Evaporator Superheat	_____°F.		
Cooler Discharge Temp.	_____°F.		
Freezer Discharge Temp.	_____°F.		
Ice Storage Discharge Temp.	_____°F.		

Notes

Notes

Notes

WARNING

Refrigerant can be harmful if it is inhaled. Refrigerant must be used and recovered responsibly. Failure to follow this warning may result in personal injury or death.

Since product improvement is a continuing effort at Heatcraft Refrigeration Products, we reserve the right to make changes in specifications without notice.

HEATCRAFT Refrigeration Products

2175 W. Park Place Blvd. • Stone Mountain, Georgia 30087
(770) 465-5600 • Fax: (770) 465-5990
www.heatcraftrpd.com • e-mail: hrpd.feedback@heatcraft.com